MAY, 1953

METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS
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Developments in Selenium Rectifiers
Notes on the Peeling of Nickel Deposits
Immersion Brass Coatings of Steel
Pickling and Bright Dipping
Western Metal Show and Congress
Complete Contents Page 53

Read & Pass On

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METAL FINISHING

MAY 1953 VOLUME 51 • NUMBER 5

CONTENTS

Editorial 55

Recent Developments and Life Characteristics of Selenium Rectifiers 56
By C. E. Brigham

Notes on the Peeling of Nickel Deposits — Conclusion 60
By Edmund T. Richards

Immersion Brass Coatings of Steel 66
By Hartmut W. Richter

Pickling and Bright Dipping of Copper and Copper-Rich Alloys 68
By E. E. Halls

Western Metal Show and Congress 74
By Fred A. Herr

Abstracts from the World's Plating Literature 77

Shop Problems 80

Patents 82

Recent Developments 84

Manufacturers' Literature 92

Business Items 98

Obituaries 111

Motor City Plating News 112

News from California 116

Associations and Societies 119

Letter to the Editor 130

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The history of analytical control of plating solutions from the personal experience of George B. Hogaboom.

An interesting article on methods and equipment used for quality production in the finishing industry.

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METAL FINISHING

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Politics And The Bureau of Standards

Readers of METAL FINISHING may have noticed that this page has generally concerned itself with matters of special interest to our industry, the field of political comment being left to the pages of the daily press. The intrusion of politics into the operation of the *National Bureau of Standards*, however, is a circumstance which calls for deviation from this policy, since the Bureau has been an especially prominent source of metal finishing developments.

The recent, unceremonious ousting of *Dr. Allen V. Astin* as director of the Bureau cannot simply be dismissed as a routine application of the "spoils system" because it involves a reflection on the integrity of a government department which, like Caesar's wife, has been considered beyond suspicion. The statement of Secretary of Commerce, *Sinclair Weeks*, that Dr. Astin was dismissed because he was "not sufficiently objective" in connection with the Bureau's refusal to endorse a commercial product, has aroused a storm of protest. We add our voice to the group which includes *The Electrochemical Society*, *Federation of American Scientists*, *American Institute of Physics* and the *Washington Academy of Sciences*, the last a federation of twenty-one scientific societies in the capital.

At the time we go to press, Senate hearings have been called to examine Dr. Astin's ouster and, we hope, to develop the validity of the charges and countercharges which have been flying back and forth. The Bureau, however, has earned an extraordinary reputation for objectivity in its fifty years of existence and, if Secretary Weeks believes this reputation is no longer justified, as his recent statements would indicate, we are entitled to know why. Otherwise, the impression will remain that high technical positions in the Government are to be subject to political pressure.

The National Bureau of Standards is a scientific agency and it must remain so; the directorship of this bureau is a technical position and has always been considered one. It is not a political job, subject to patronage of changing Administrations, nor must it be permitted to become one.

Nathaniel Hall

Recent Developments and Life Characteristics of Selenium Rectifiers

By C. E. Brigham, *Vice-President in Charge of Engineering, Richardson-Allen Corporation, College Point, N. Y.*

Introduction

TEN years ago the term "rectifier" had very little significance, and many were doubtful whether this new source of D.C. power could be used successfully in the well-established and valued plating industry.

During these years, a great deal of progress has been made in the development and practical application of these new devices which convert alternating current to meet the direct current requirements.

Not only has the word "rectifier" a particular significance to the plater, but a rectifier today is an accepted article and the association of "selenium" with the word "rectifier" has proven itself over these years as a reliable and dependable source of D.C. power.

In the early developments of selenium rectifiers, one was particularly anxious to know about certain fundamental characteristics of selenium rectifiers — how the efficiencies and other electrical qualities of these rectifiers compared with the motor generator which had served the industry so faithfully and well for so many years.

However, the importance of long life in the D.C. power equipment necessary to meet the exact requirements was not known. This article is an attempt to determine to an accurate degree what factors influence the life characteristics of selenium rectifiers.

Aging

Well over two years ago, a research study was made in many parts of the country under all kinds of conditions, making test measurements and field observations on a large number of selenium rectifiers.

A method was devised by which a rectifier could be tested without hindrance to production. It was only necessary to take note of the D.C. output voltage and current conditions. Under these conditions certain A.C. measurements were made inside the rectifier. For a given D.C. condition, and by mathematical calculations from the A.C. and D.C. measurements, the aging characteristics of the selenium plates in the rectifier can be determined to quite an accurate degree.

By repeating these measurements periodically on a given rectifier, the results can be plotted over a period of time, and an "aging" curve can be made on the rectifier.

It has already taken over two years to obtain sufficient data to draw even the least conclusions. During this period over 100 selenium rectifiers were repeatedly tested. More than 400 field test observations were made on these rectifiers, and over 5000 readings were recorded, not to mention the many hours of mathematical calculations.

Many of the selenium rectifiers under test observations were standard 1500 ampere units rated at 12 volts. Several 3000, 4000 and 5000 ampere units are included in the tests rated at 12 volts, 9 volts or 6 volts.

Many rectifiers in plating plants have been under observations for several years.

Figure 1 is a table showing the readings recorded on twenty selenium rectifiers after 6096 hours of continuous operation.

These readings show the D.C. output voltage and current readings on a given rectifier at the time of the test observation. The A.C. measurements inside the rectifier were taken on each phase of the three phase rectifier and the average noted. By calculation, the theoretical new and stabilized A.C. conditions are known for a given D.C. output condition. By comparing the theoretical A.C. conditions with the practical A.C. measurements taken inside the rectifier, it can be determined to what extent the selenium rectifier has aged from the original new condition.

Figure 2 shows the average aging characteristics on these rectifiers after 14,000 hours of operation.

The aging curves in Figure 2 are of particular interest because they represent the most severe operating conditions, since they have been operating five, six and seven days a week, 24 hours a day for over two years.

It is interesting to note that 8760 hours are consumed in a year operating seven days a week, 24 hours a day; 7488 hours operating six days a week, 24 hours a day; and 6240 hours when operating five days a week, 24 hours a day. Comparing these operating conditions with those of average plants, many of which are operating only one to two eight-hour shifts per day, it will be observed that one can expect many years of life from a selenium rectifier.

These curves show about a 10% to 12% aging characteristic. It is for this reason that reputable rectifier manufacturers must take into consideration the inherent aging characteristic of the rectifier in its original design, in order that full D.C. output can be obtained at all times.

In the first test observations, readings were not recorded until the rectifiers had been in operation from 3000 to 6000 hours, and it was assumed that the read-

TEST OBSERVATIONS

Cell No.	DC Output Volts	DC Output Amperes	% Full Load	Tap Switches	AC Input Measurements Per Phase	AC Input Measurements Average	Theoretical AC Input Measurements New	Theoretical AC Input Measurements Stabilized	AC Amperes
60	11.3	1320	88%	8-8-8	12.1 -12.11-12.25	12.15	11.56	12.52	29.5-29-30
59	10.8	1330	88.7%	8-8-7	11.51-11.0 -12.02	11.51	11.45	12.40	31.0-26.5-29
58	10.7	1180	78.7%	7-8-7	11.69-11.05-11.55	11.43	10.94	11.85	24.0-26.5-24
57	11.6	1480	98.7%	8-9-9	13.0 -12.68-12.68	12.70	11.89	12.90	32.0-34.0-36
56	11.5	1475	98.4%	9-9-8	12.6 -12.49-13.05	12.38	11.84	12.85	34.5-33.0-30
55	10.0	1100	73.4%	7-7-6	10.03-10.03-10.95	10.34	10.28	11.14	23.0-21.0-23
54	8.9	800	53.4%	5-5-6	9.3 - 9.36- 8.84	9.17	9.1	9.84	17.0-15.5-18.5
53	9.0	840	56.0%	5-6-6	9.88- 9.49- 9.43	9.60	9.21	9.97	17.0-17.9-18.4
52	8.8	820	54.7%	6-5-5	9.30- 9.30- 8.84	9.15	9.04	9.79	16.5-19.0-16.0
51	8.8	860	57.4%	5-5-6	9.3 - 9.3 - 8.8	9.15	9.06	9.83	16.5-20.0-16.8
50	9.9	1220	81.4%	7-7-7	10.85-10.92-10.92	10.89	10.28	11.19	22.0-24.0-25.5
49	8.8	970	64.6%	5-5-6	9.25- 9.82- 9.3	9.46	9.15	9.76	16.0-19.5-20.0
48	9.8	1170	78.0%	7-7-6	10.45-10.45-11.25	10.72	10.14	11.04	25.5-23.5-20.0
47	8.4	670	44.7%	4-5-5	8.9 - 8.34- 8.39	8.54	8.58	9.28	15.0-16.5-13.0
46	8.2	680	45.35%	4-5-5	8.95- 8.34- 8.39	8.56	8.36	9.03	15.0-16.5-13.0
45	8.6	900	60.0%	5-6-6	9.36- 9.49- 8.90	9.25	8.91	9.69	17.0-16.0-19.5
44	8.2	690	46.0%	4-5-5	8.95- 8.34- 8.39	8.56	8.41	9.12	15.0-16.5-13.0
43	8.4	735	49.0%	5-5-4	8.84- 8.9 - 8.9	8.88	8.61	9.32	16.5-15.0-15.5
42	8.5	900	60.0%	5-5-6	9.46- 9.44- 8.86	9.25	8.82	9.60	16.5-19.0-16.0
41	9.0	930	62.0%	6-6-5	9.44- 9.44-10.0	9.63	9.28	10.07	17.0-18.0-19.5

AC Input: 480 volts, 60 cycles, 3 phase. Selenium Rectifiers, 12 V./1500 Amp.
Rectifiers in Operation: 6096 hours — 6 and 7 days a week — 24 hours per day.

Figure 1

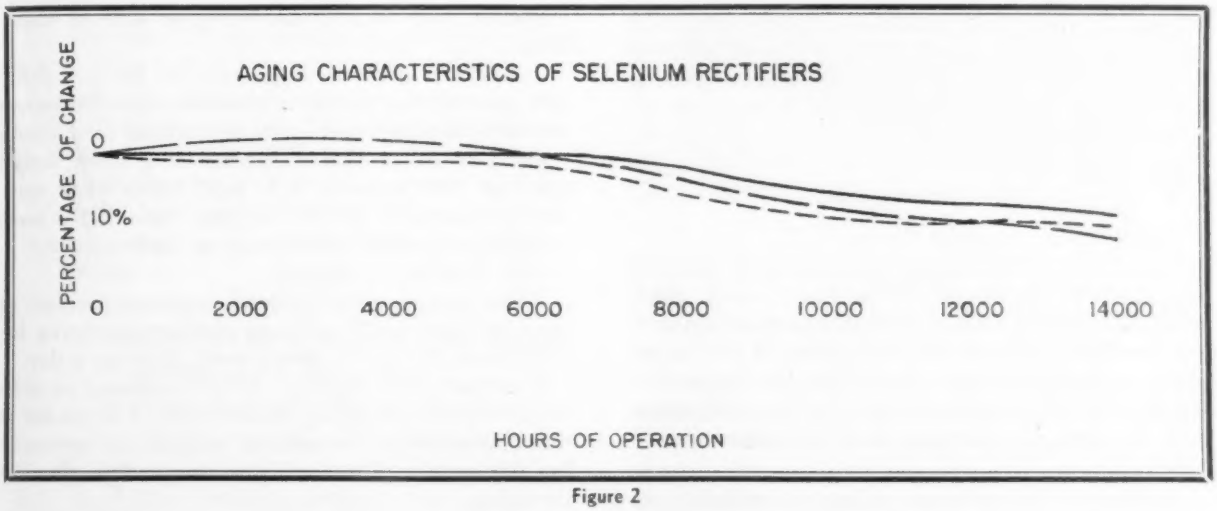

Figure 2

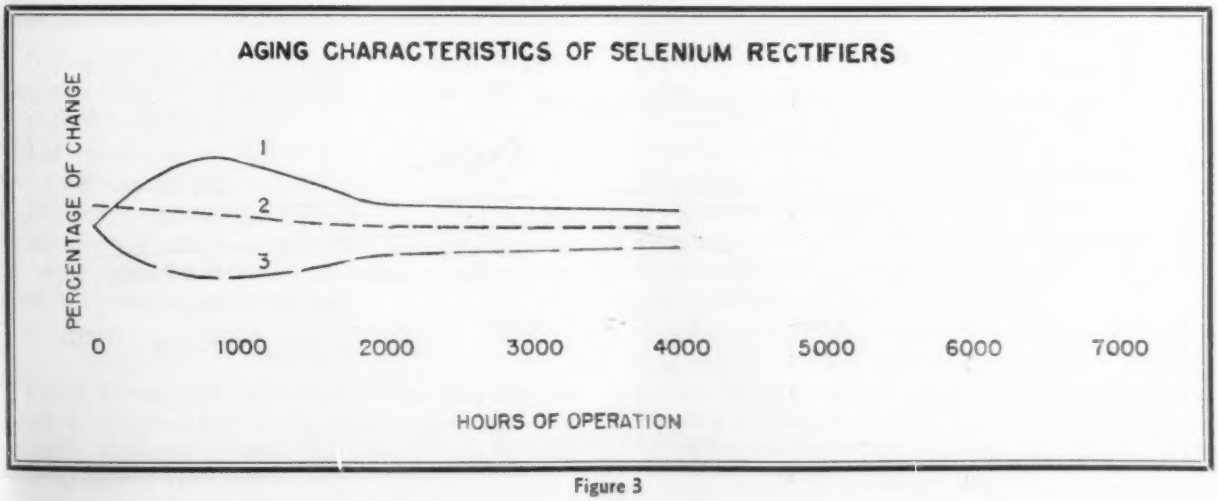

Figure 3

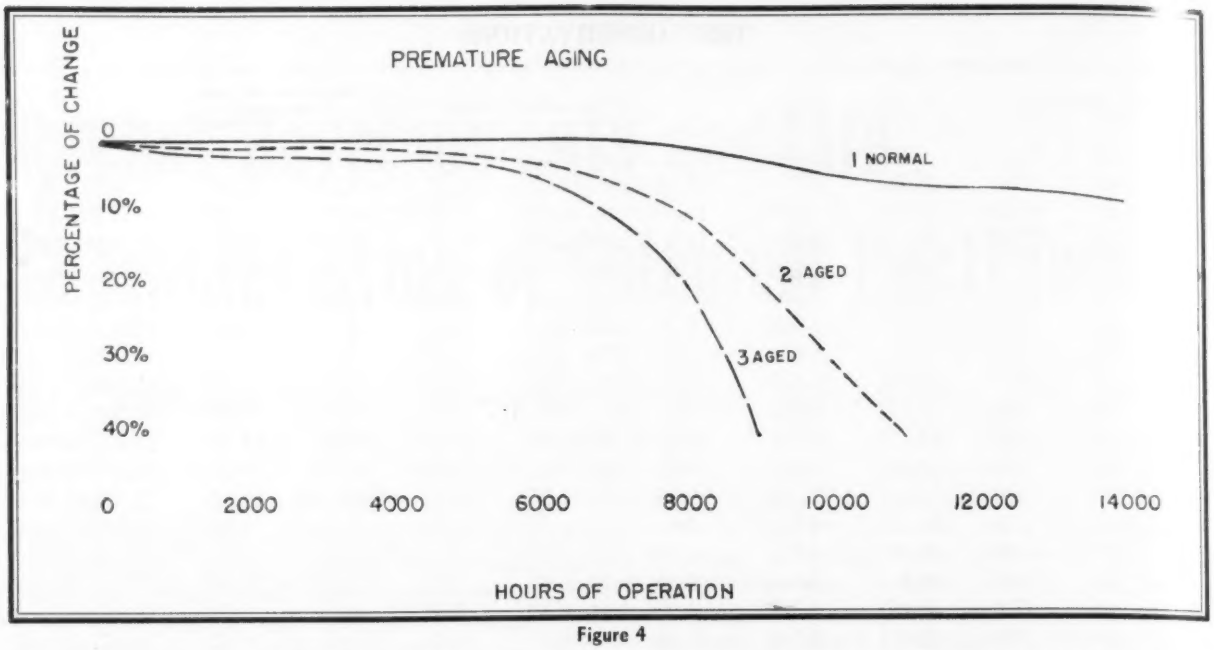

Figure 4

ings were uniform and had not changed prior to 3000 hours. This is not quite true, as shown by a set of readings taken on another set of rectifiers during the first 4000 hours of operation as shown in Figure 3.

If one looks inside a selenium rectifier, he will observe a quantity of rectangular selenium plates. A large number of these plates are in parallel, and it appears from Figure 3 that during the first 1000-2000 hours, it takes a certain time for some of these selenium plates to equalize themselves before a degree of stabilization is reached.

Premature Aging

This is shown clearly in Figure 4.

Curves 2 and 3 show premature aging. It will still be a long time before all the facts are known which cause premature aging. In general, premature aging is not caused by defective selenium plates. If a selenium plate or stack is defective, experience has shown that the rectifier fails within the first few hundred hours, and, of course, the selenium stack is replaced free of charge.

In Figure 4, the premature aging was caused by an intermittent overload condition. It is interesting to note that in spite of this premature aging, the rectifiers continued in operation for many thousand of hours. At least it is encouraging that one does not have to worry that the rectifiers are going "dead" due to any premature aging conditions. Selenium rectifiers age gradually, even in a premature aging state of condition.

It has been suspected for some time, but now definitely proven, that the aging characteristic of selenium rectifiers, is dependent upon the current load conditions. This means that a rectifier of a given design rated at 1500 amperes, will "age" faster when operated continuously at 1500 amperes, than if the same rectifier is operated continuously at 1000 amperes.

This is shown in Figure 5.

These curves were obtained from an average of readings taken on 20 selenium rectifiers operating for 7000 hours, five to six days a week, 24 hours a day.

From the set of readings, already obtained on selenium rectifiers, the aging characteristic of a rectifier is also determined by the ambient temperature surrounding the rectifier. The cooler the temperature, the less the aging.

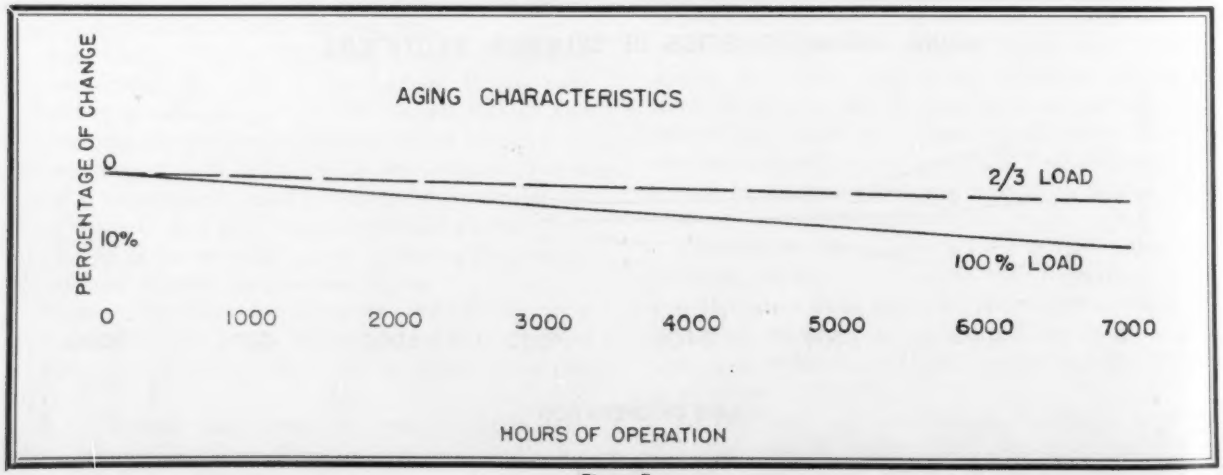

Figure 5

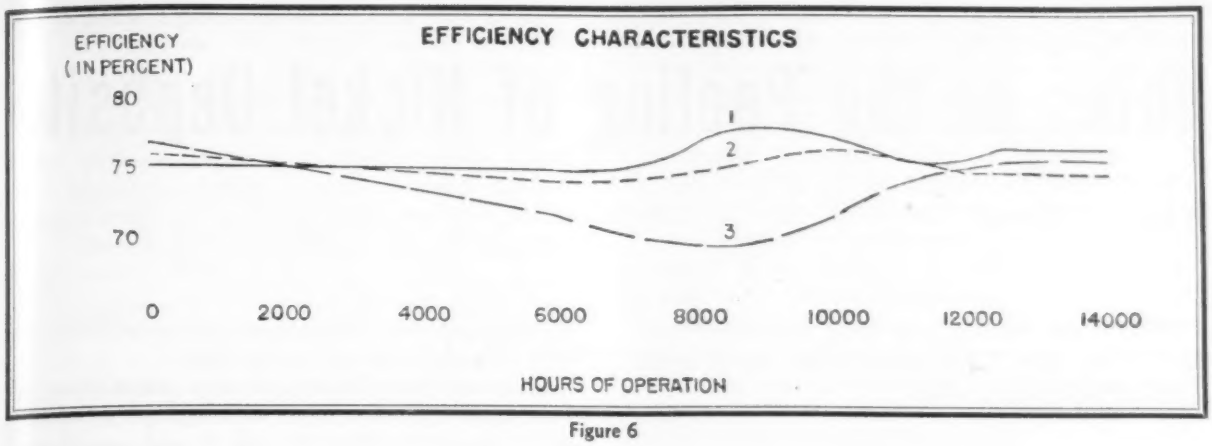

Figure 6

This conclusion was readily obtained by observations on a number of rectifiers which had external air ducts supplying the rectifiers with fresh clean air at all times. Readings were recorded with and without the advantages of the fresh air coming into the rectifiers.

From these curves and test readings obtained up to the present time, the following deductions can be obtained.

1. Aging in a selenium rectifier is very gradual and, under proper operating conditions, the life expectancy is a great many years.
2. The aging characteristic of a selenium rectifier is dependent on the current load conditions.
3. Aging is dependent upon the continuous duty cycle of the rectifier. A rectifier operating only eight hours a day, will age less than if this rectifier was operating under the same condition for 16 hours and 24 hours a day.
4. Premature aging is caused by the following conditions:
   a. Current overloading of any degree.
   b. Excessive hot surrounding room temperature.
   c. Poor ventilation to the rectifier.
   d. Improper cleaning of the rectifier. Dust collection and clogging of the stacks from dirt.
   e. Contamination by excessive acid fumes and alkaline dust from plating tanks.

Efficiency

During this period in the aging of a selenium rectifier, a number of readers will wish to know what happens to the efficiency.

The results up to 14,000 hours of operation are encouraging, as shown by Figure 6.

The change in the efficiencies is only a few percent at the most. There is an indication that the efficiency of some selenium rectifiers increases under certain condition, over a period of time.

Recent Improvements

From the previous discussions, it was seen that the aging of selenium rectifiers is very gradual and in a properly designed rectifier the aging is not serious over the life of the rectifier.

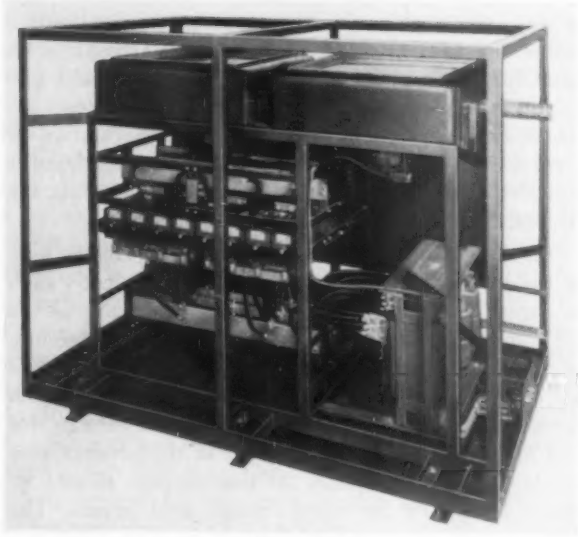

Figure 7

However, there is a very definite indication that aging of a rectifier can be lessened to a large degree, and consequently the life of the rectifier greatly increased by designing the rectifier more conservatively.

Aging is caused primarily by heat dissipation on the selenium plate. For a given D.C. rating, if more square area of selenium is used in a rectifier, or in other words more selenium plates employed, aging of a rectifier can be cut down to a minimum.

Some readers are probably saying to themselves that this is nothing new, they have the same thing in motor generator sets with their 40° and 25° rise machines.

This is becoming true in the better designed selenium rectifiers today and plus-rated rectifiers will give qualities equivalent to M/G sets with longer life characteristics, and 25% overload current possibilities.

When the surrounding air is excessively hot or the air is contaminated by bad acid fumes and impurities, the water cooled heat exchanger principle is employed. This is shown in Figure 7.

This construction consists of a chamber within a chamber. The inner chamber houses the selenium stacks, transformers, and forced-cooling fan. The inner chamber is completely enclosed except for an opening above the heat exchanger unit and the opening under

(*Concluded on page 65*)

Notes on the Peeling of Nickel Deposits

By Edmund T. Richards

This is the second and final installment of this article. Part I appeared in the April issue of *Metal Finishing*.—Ed.

Organic Acids

The concentration of the organic acid contents plays a very important part in the operation of many nickel baths especially in bright nickel plating. Organic acids used for this purpose are citric acid, acetic acid, tartaric acid, formic acid, organic sulfonic acids, etc. These acids and their salts lead to the formation of hard, bright and mechanically resistant nickel deposits but also to the creation of internal stresses within the deposits.

All these effects are favorable in themselves as long as the internal stresses do not become sufficiently high to exceed the degree of adhesion and as long as the high degree of hardness does not suddenly change into pronounced brittleness. This change can be brought about by very slight excesses of organic acids, which depend on the general composition of the electrolytes and on the electrolytic conditions of the process as a whole. It is not necessary for this purpose to add an excess of one or the other organic acid or salt. The difficulty may arise without the slightest change of percentage of these substances, i.e. if the electrical, physical and thermal conditions of the process are changed intentionally or unintentionally. Current densities, pH and temperatures of the bath are equally important in this connection.

Attention is also called to the fact that some constituents, such as chromic acid, which may under certain conditions be tolerated within certain low percentage ranges in ordinary nickel baths, are downright poison in bright nickel solutions containing organic acids and should not, for this reason, be present even in slight traces. This point should always be kept in mind when studying the problem of whether peeling or scaling of nickel deposits is to be charged to the presence of or to an excess of organic acids. It may be true that, on removing the acid, peeling of the deposits may cease, but this is not sufficient proof of the deteriorating influence of organic acids. It might have been much more advantageous to remove the traces of deteriorating substances (such as chromic acid) mentioned and still retain the advantages offered by the organic acid contents under generally favorable operating conditions. The same applies to all other factors of importance rendering organic acids undesirable in nickel electrolytes. It is sometimes possible to change these conditions entirely by effecting slight modifications of operating temperatures, current densities, pH values, etc. where the removal of the organic acid constituents will induce disadvantages of various degrees.

There can be no doubt in any case that a change of these factors is often more advantageous technically and economically than the tedious and complicated process of removal of organic acids. The author has found, and believes most practical authorities will agree with him, that in 99 percent of all cases of trouble from this direction the unfavorable action of slight excesses of organic acids can be eliminated by a usually insignificant modification of some other factor. The only satisfactory process of removal of organic acids is the hot oxidizing process with ammonium persulphate, hydrogen peroxide, potassium permanganate, etc., although sometimes proprietary regenerating salts are employed for this purpose.

Solution pH

The influence of the pH of nickel solutions on the peeling or scaling of nickel deposits affect practically all other factors of the process but is governed itself by a number of factors such as composition of the electrolytes, current densities, type of nickel deposit desired, presence of certain special substances, such as brightening agents, etc. It is for this reason that no definite pH values can be stated beforehand for every electrolyte, and it is the task of the operator to determine by test whether the degree of acidity of the nickel bath in question is correct or if the acid content is too high or too low. Excessive acid contents tend to induce hard, brittle and peeling deposits although slight excesses are effectively counteracted by buffer agents such as boric acid.

It must also be considered that conditions in common nickel baths differ considerably from those prevailing in the special solutions of low pH values, operating at correspondingly higher current densities, which yield softer and more ductile nickel deposits than many baths of 3-6 pH. If these special solutions are not maintained at the low pH, they will induce peeling tendencies of much higher degree than excessive acid contents in normal nickel baths.

It is not the purpose of this article to dwell on the relative characteristics and effects of pH but to point out the factors leading to the formation of peeling deposits. It should be remembered, therefore, that as a rule the pH values must not be regarded as guiding principle, as they frequently are, but merely as one of the factors ensuring satisfactory deposits. If, under the general operating conditions selected, the optimum pH is satisfactorily determined it should be maintained as long as the other conditions remain unchanged. It is obvious, of course, that certain deviations in both directions (within the optimum range in question) in

order to attain certain important effects such as high throwing power, etc., are always possible. In most cases this range is more flexible towards higher pH values than in the other direction, although in solutions of high metal contents relatively high pH values always are less favorable than in electrolytes containing lower percentages of nickel salts. This does not apply to the operating range as a whole, however, since this usually is widened towards both sides by low pH in baths of high metal contents.

While high and low pH induce peeling and scaling of nickel deposits these two factors are clearly characterized by a number of auxiliary symptoms. In the case of excessively high degrees of acidity the deposits are bright and brittle and a clear white color, while low acidities usually tend to produce dark deposits, hard and peeling like the others.

The counter measures to be adopted in either case are self-evident, although the addition of nickel carbonate, ammonia or other alkaline or basic substances on one hand and of sulphuric acid on the other may not always be the correct one unless by negligence or some accident the lack or excess of acid contents have become too large to be corrected by any other means. It is frequently possible, however, to effect slight changes of galvanic conditions suited to the pH in question which may be of greater value to the process and to the quality of nickel deposits than a straight correction by carbonate or acid.

Organic Impurities

Organic impurities in nickel solutions are produced by the solution of lignin substances from plating tanks. Other sources of impurities of this type are the anode bags frequently used in nickel plating, especially if these are made from calico, felt or pure silk, although most other bag material, such as cotton or paper, will produce similar effects if, previous to putting them into use, they have not been pretreated by suitable means. As a rule, these anode bags are boiled in a small part of the electrolyte in which they are to be employed. Dextrin and gelatin are the substances most generally derived from these sources.

Organic contaminants are also derived occasionally from residues of brightening agents of the aromatic and aliphatic series of substances such as naphthalene, substituted naphthalene, naphthols, formaldehyde, acetaldehyde, thiourea and a number of albumins. Relatively small quantities of all these substances induce the formation of bright, hard and peeling deposits.

Removal of these organic substances can be effected by three processes:

1. Oxidation with hydrogen peroxide or potassium permanganate.
2. Adsorption, usually by means of hydrated manganese dioxide.
3. "Dummying out" the electrolyte (electrolysis on sheet cathodes).

Hydrogen peroxide, chlorine and chromic acid have been suggested for this purpose but are unable to effect the removal of all the organic impurities in question, at least without inducing certain disadvantages in other directions.

The only common oxidizing agent perfectly suited for this purpose is potassium permanganate added to the electrolyte after acidifying the latter with sulphuric acid to a pH a little below 3.0 and heating almost to boiling. 0.2 percent of potassium permanganate is then added and the heating is continued for another 10 or 15 minutes. The amount of potassium permanganate added must suffice to maintain a pink color.

The excess of permanganate remaining after the treatment is eliminated by the addition of hydrogen peroxide in an amount just sufficient to effect this reaction. Manganese dioxide is precipitated, which possesses adsorptive influence on many organic substances, so that any organic contaminants remaining after the oxidizing treatment proper are probably removed by the adsorptive action of this product.

This property of manganese dioxide is frequently utilized by adding to the electrolyte a mixture consisting of 10 parts manganese sulphate and 4 parts potassium permanganate; 0.2 oz./gal. of this mixture then being stirred into the electrolyte, heated to a temperature of about 90-100°F. The solution is permitted to stand at rest for about 12 hours and is then filtered.

The dummying-out treatment of contaminated solutions involves (1) the addition of 1 gallon of hydrogen peroxide to 1000 gallons of electrolyte and setting of the pH at 6.3. Sheet cathodes of sufficient area are then immersed and a current at 4 to 5 volts conducted through the electrolyte for about 12 to 18 hours. The various anodic and cathodic processes involved oxidize a very large proportion of organic contaminants at the anodes while the nickel hydroxide produced carries iron and zinc along wtih it. The dummied solution is then filtered and returned into the carefully cleaned tank.

It is true that these processes do not always effect perfect purification of the electrolytes but they generally suffice to render them workable again. The deposits sometimes stay comparatively bright even after this treatment but they are not brittle and peeling like those produced with contaminated solutions.

Oxidizing agents must not be permitted to remain in nickel solutions even where they have been added for purposes of purification. Complete freedom from oxidizing agents is one of the conditions of successful nickel plating. The presence of oxidizing substances in nickel baths reduces the throwing power and widens the range of peeling conditions. All factors acting towards the production of peeling or flaking deposits are thus supported in their effects by the presence of these oxidizing substances.

Temperature and Concentration

The operating temperatures play an important direct and indirect part in governing the quality of nickel deposits and their tendencies towards peeling and flaking. It is a fact that under normal operating conditions the optimum range of temperature is rather wide as long as it does not drop below 65-70°F. If the operating temperature drops below 60°F. (during the winter period), the nickel deposits produced are bright and tend to crack and peel, while no nickel is deposited in deep recesses. Other phenomena indicating low temperatures as fundamental causes of cracking and peeling are:

1. Crystallization of salt on the anodes and the walls of the tanks, (also produced by excessive metal contents).
2. Reduction of anode and cathode efficiency.
3. Reduction of solution viscosity.
4. Lack of throwing power.
5. Increase of stresses within the deposits.
6. The electrolytes gradually turn acid.
7. The deposits tend to become porous.
8. A smell of ozone is frequently developed at the anodes.

All these symptoms are eliminated by raising the operating temperatures to 75-95°F. The deposits turn more ductile and the internal stresses are considerably reduced.

Excessive concentration of nickel salts in the baths also induce peeling tendencies in nickel deposits, while an excess of single salts (in relation to the total nickel salt contents) causes the deposits to flake off. It is true that modern rapid plating electrolytes contain much higher nickel contents (from 30 to 70 oz./gal.) but these can be maintained only by corresponding adjustment of the other operating factors such as operating temperatures, current density, agitation of solution, etc.

Insufficient concentration of nickel salts in the electrolyte also causes plating faults such as pores, dull deposits (occasionally like lead deposits), etc. but does not induce peeling.

All the symptoms mentioned for this fault are no clear indications, however, and may just as well be due to any number of other causes. Hydrometer readings also do not indicate the nickel salt concentrations, and it is dangerous to carry out "corrections" of the nickel salt contents without analysis. It is true that the useful range of concentration is comparatively wide under all circumstances, but the optimum ranges are much more narrow and, while incorrect "corrections" may not become direct causes of peeling, they may influence and support other factors operating in this direction. It is a matter of experience that in most cases, apparently involving excessive or insufficient metal concentration, other factors such as incorrect current conditions or faulty concentration of any of the other constituents of nickel baths may be the real reason for the symptoms in question. If it is shown by analysis that the solution actually lacks nickel salts, the addition of a corresponding amount of single nickel salt usually suffices to eliminate the difficulty while, in the reverse case, the electrolyte should be diluted and the total composition be corrected by the addition of conducting salt, buffer agents, etc.

Excessive concentration of conducting salts leading to the excessive generation of hydrogen at the cathode naturally induces very bright, hard and peeling nickel deposits. This applies especially to sodium chloride, which also exerts a very pronounced positive influence on the degree of solubility of the nickel anodes and which, if present in excess, may therefore cause excessive concentration of nickel salts in the electrolytes and too rapid deposition of nickel within too short a time, causing strong peeling of the deposits.

Sodium chloride as well as the other salts generally classified under the term "conducting salts," such as ammonium chloride and sulphate, sodium sulphate, fluorides, etc., are usually added to improve anode solubility, the degree of conductivity and the throwing power of the bath. Apart from the two disadvantages above mentioned, excessive concentration of these salts tends to increase the internal stresses within the deposits, a fact probably due to the close interconnection between the pH values and some conducting salts, especially sodium chloride. The higher the sodium chloride contents of the electrolytes, the lower should be the pH in order to prevent peeling of the deposits and the narrower is the useful range of pH.

It is a matter of practical experience, however, that insufficient concentration of conducting salts is a more frequent source of trouble than excessive concentration although, as a rule, peeling of nickel deposits is not a direct consequence of this fault. The most common difficulties arising from lack of conducting salts in nickel electrolytes are:

1. Black stains within the recesses of the plated articles.
2. Gray stains near the points of cathodic contact.
3. Initially white color of the deposits produced, turning lead-gray after a short time.
4. Relatively slow deposition of nickel.
5. Cloudy and, sometimes, streaky deposits.

Current Density

The problems connected with the effects of high current densities on the peeling and flaking tendencies of nickel deposits are governed by principles similar to those prevailing for high contents of conducting salts and acidity of the electrolyte as well as all other factors inducing excessive generation of hydrogen at the cathode faces and relatively high adsorption of hydrogen by the nickel deposits. Current densities which with medium pH values and normal operating conditions must be considered excessive and which, besides other disadvantages, lead to bright, hard and peeling deposits, may prove to be much too low in connection with relatively low pH values and corresponding adjustment of plating conditions.

High anode current densities are sometimes caused by badly conducting or non-conducting anodes, incorrect arrangement of the large and small anodes, etc. If the anode area is too small, the bath may gradually become too acid, introducing the disadvantages mentioned above.

It has been stated that excessively high current densities are indicated by a lively development of hydrogen bubbles at the cathode faces. If this condition is permitted to prevail for a prolonged time, the deposit becomes dark and, finally, black and powdery. In view of the fact that the excessive development of hydrogen forms a clear indication of trouble, these consequences should always be averted, however.

It is rather more difficult sometimes to decide on the basic cause of this phenomenon, i.e. whether it is due to high current densities, excessive concentration of acid, conducting salts, etc. but it is really only a matter of routine with modern measuring apparatus, not only to determine the fault within a minimum of time but also to eliminate it at once.

Too rapid and too heavy deposition of nickel also tends to cause peeling and scaling under the influence of mechanical stresses although, if internal tensions within the deposit are too high (due to hydrogen contents), the fault may arise without any visible outside influence.

Rapid and heavy deposition of nickel rarely occurs in connection with excessive generation of hydrogen at the cathodes since, as a matter of experience, and for obvious theoretical and practical reasons, the latter phenomenon is usually accompanied by correspondingly slow and thin plating. Nevertheless, operating conditions may be such as to actually combine both phenomena; for instance, the difference between current input and the amount of current consumed by the cathodic development of hydrogen may still suffice to deposit comparatively large quantities of nickel within a minimum of time. Reduction of current input usually eliminates this fault although it is sometimes necessary to correct one or the other factor such as the percentage of conducting salts, pH values, etc.

The appearance of nickel deposits of this type usually is quite normal as far as color, degree of gloss and hardness are concerned, unless the adsorption of large amounts of hydrogen by the heavy deposit introduces the faults induced by this fault, i.e. the production of bright, hard and brittle, peeling nickel deposits.

Other Factors

Cleanliness of bath surface is one of the chief requirements of all electrolytic operations. Oil and other organic impurities have no place on the surface of nickel baths. Their influence on the adhesion of nickel deposits is obvious. On immersing the articles into the solution the surfaces become partially or entirely covered with oil which then serves as an isolating layer between the base surface and the deposit. Where these oily films are sufficiently heavy in spots to interrupt electrolytic reactions entirely, pores or pits may result; in most instances, the oily films are not heavy enough to interfere with normal plating conditions, but suffice to reduce the degree of adhesion so as to cause peeling of the deposits.

That too much brightening agent may be the cause of pronounced peeling of nickel deposits is a fact well-known to practical platers, although in many cases of bright nickel plating this explanation does not apply. It should be remembered that practically all causes of peeling and scaling in normal nickel baths prevail to a much higher degree in the presence of brightening agents, even if all operating requirements are fulfilled. Even the dust from the air or on the surface of the articles to be plated, slightest traces of chromic acid or chromates, additions of unfiltered nickel salts, etc. may cause difficulties eventually leading to peeling of the nickel deposits.

There are considerable differences between the effects of organic and inorganic brightening agents as far as excessive concentrations of these substances are concerned, but their action is similar in a qualitative way. Cadmium and zinc salts are the most common inorganic brightening agents employed. Their influence on nickel deposits has already been discussed. The limiting values of cadmium additions are about 0.08-0.10 percent of cadmium sulphate and about half of this percentage of zinc salts — depending on general operating conditions. Somewhat higher percentages may be present if all other conditions are just right, but the optimum range is very narrow, and auxiliary factors comparatively harmless in themselves may suffice to induce peeling of the nickel deposits produced.

In the case of nickel plating of zinc or zinc alloys, peeling may be induced by insufficiently thick preliminary copper or brass deposits. It is a well-known fact that copper and brass films on zinc surfaces tend to diffuse into the base metal so that, if these films are too thin, they will sometimes disappear entirely within a comparatively short time, leaving the superimposed nickel deposits to rest directly on the zinc surface without sufficient adhesion to ensure the metallic, or intermetallic, contact required. Peeling of the deposit is then bound to take place within a comparatively short time, depending on the external effects involved.

The influence of pores, oxide inclusions, etc. on the peeling of nickel deposits is of a purely physical character only, even if it is accompanied by other factors reducing the degree of adhesion of deposits at the same time. In this latter case, both factors will cooperate in the rapidity and intensity of peeling and scaling phenomena. The direct influence of pores, oxide inclusions, etc. on this plating fault is that the surface pressure holding the nickel deposits in place (in addition to the effects of adhesion) becomes ineffective on account of the interruption of continuity of the film. If, for some internal or external reason, the stresses acting on the deposits exceed the tensile strength (weakened by porosity and inclusions) cracking, eventually followed by peeling, is bound to result.

Excessive buffing of nickel deposits may lead to peeling chiefly for two reasons:

1. On account of excessively heavy buffing of local portions of the surface, for instance over slightly raised or rough sections of the base surface, so that with straight buffing the films above the sections in question may only be half as thick, or less, than the rest of the nickel deposits. The internal tension prevailing in the thicker sections of the films may then become too high for the areas of nickel deposits thinned out by buffing, resulting in cracking and, finally, in peeling of the deposits. This applies especially where, for some contributary reason or reasons, adhesion of the nickel deposits is not particularly high.
2. Heavy buffing of the nickel deposits may tear out, or crack, trees or other surface faults of the deposits, forming initial points of cracking or peeling as explained previously.

Bending or twisting of nickel deposits is bound to overstress them unless they are characterized by maximum tensile strength or adhesion, especially where, for any of the causes above described, these properties are counteracted by pronounced internal stresses within the nickel films.

Cause and Effect

It has been the purpose of the above section of this paper to outline the various faults of nickel plating inducing peeling and cracking of the nickel deposits produced. It is realized that under practical conditions

of nickel plating other factors may arise which, singly or in combination with one another, will also lead to peeling or scaling of the deposits.

The following tabulation of symptoms and causes will complete the discussion of this interesting phase of the problems surrounding the possible failure of nickel deposits.

The deposit is dark and peels.

The electrolyte is alkaline.

Excessive cadmium content (bright nickel deposits often dark-shining and stained).

Improper cleaning of articles previous to plating.

Occasionally, lack of metal in electrolyte (often accompanied by porosity of deposit).

Presence of copper in solution, in addition to other factors enumerated.

Presence of aluminum.

Low current density.

Low temperature.

The deposit looks normal but peels.

Excessive concentration of nickel salts.

Excessive concentration of single salts (sometimes dark deposits).

Oil on surface of bath (sometimes yellowish deposit).

No acid-dip previous to plating (tarnished surfaces of articles to be plated).

Rapid production of heavy deposits.

In case of repeated plating, the original deposit has not been completely removed.

Soldered areas nickel plated without preliminary copper or brass plating.

Insufficient degreasing (sometimes yellowish deposits).

In case of nickel plating of zinc, etc. excessively thin preliminary copper or brass plating.

The deposit is bright, hard and brittle.

Organic impurities in the electrolyte (occasionally yellowish surface sheen).

Rapid production of heavy deposits.

High acid contents (sometimes accompanied by porosity).

High concentration of conducting salts.

High iron content (sometimes stained deposits).

Chromic acid or chromate content of electrolyte.

Excessive content of organic acids (yellowish sheen).

High current densities (excessive generation of hydrogen at cathodes).

Improper cleaning of base surfaces (deposits sometimes dark and/or normal).

Too much colloid in electrolyte.

The deposit can be pulled off.

Insufficient degreasing (sometimes yellow deposit, porosity or brittle plating which cannot be pulled off).

Oil on surface of electrolyte.

Surface oxidized after degreasing and pickling. No acid dip previous to plating.

Solid impurities in electrolyte (sometimes rough deposits).

In case of nickel plated zinc, etc., thin preliminary copper or brass plating.

Repeated interruption of current (deposit can be pulled off in thin layers).

In case of repeated nickel plating, the original deposit has not been completely removed.

The deposit can be rubbed off and is dark.

The electrolyte is alkaline (cloudy solution).

The deposit comes off in small flakes.

Cyanide content in electrolyte.

Bright nickel deposits dark, stained and peeling.

Insufficient acid contents (sometimes yellow stains after drying of deposit).

The deposit is dull and peels.

High temperature of electrolyte.

Excessive metal concentration.

The deposit is discolored, stained, striped and peels.

Excessive cadmium content (occasionally dark-glossy and brittle).

Zinc content (formation of black and white stripes in vertical direction).

Excessive lead content.

Excessive iron content (black spots in recesses, which may also be caused by zinc or copper; yellow stains on dried deposits.

Bright deposit dull-stained and easily flaking.

Insufficient degreasing.

The above list of symptoms is not complete by any means and does not contain any of the numerous possibilities of cooperation of a number of factors. Thus the presence of copper in the electrolyte, in connection with any of the factors mentioned may change the white gloss into a dark colored deposit.

It is also possible, on the other hand, that one single cause of trouble may induce two or three different symptoms, especially where it is able to give rise to other difficulties characterized by their own symptoms. A typical example of this type is the influence of low operating temperatures, which may give rise to the following difficulties:

1. Excessively slow plating (which, however may also be caused by any of the factors inducing excessive generation of hydrogen at the cathode as well as by low metal contents, low current densities, etc.)
2. High degree of porosity of deposit.
3. Gradual increase of acid content (which then induces its own symptoms such as bright, hard and brittle, peeling deposits).

Another typical example is given by alkaline baths which may induce (1) dull and discolored, (2) dark and dull, (3) yellow-stained, (4) easily rubbed-off, (5) scaling or peeling deposits, while the reason for this alkalinity may be found in a lack of boric acid content, transport of alkaline cleaners into the bath (due to faulty rinsing), high chloride content of electrolyte, etc.

The immense importance of the problems underlying

the peeling of nickel deposits is demonstrated by the great amount of technical literature on this subject. Attention is called to the following literature references representing an abridged list of publications on this and related subjects.

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SELENIUM RECTIFIERS

(*Concluded from page* 59)

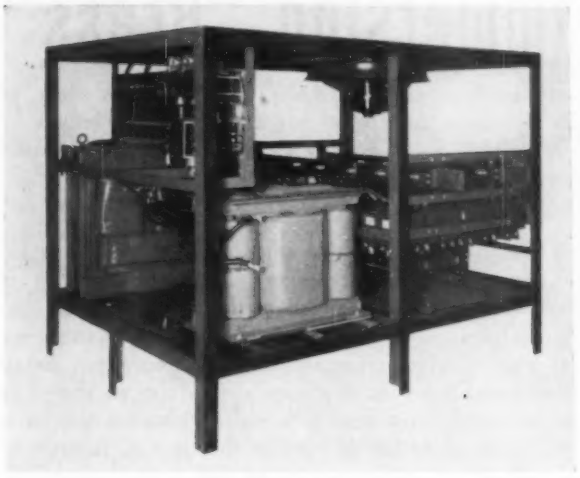


Figure 8

the inner chamber. The outer chamber is completely enclosed and air tight.

As cool water passes through the heat exchanger unit shown at the top of the inner chamber, fresh cool air surrounds the inner chamber at all times, maintaining the inner chamber at a constant cool temperature.

Such a selenium rectifier requires no cleaning or oiling of the fan.

In very large installations of 4000 amperes and higher, for greater productivity, automatic control of the D.C. output voltage or current may become very important. The electrodeposition is more constant, and less labor is required.

With such installations, a smooth, continuously variable stepless voltage control is possible by means of a saturable iron core reactor control. This is more expensive than an ordinary tap switch control.

In the best designs of selenium rectifiers today, automatic voltage control is obtained by means of magnetic amplifiers in conjunction with the saturable iron core reactor control. Constant automatic voltage or current control for any present condition is possible with selenium rectifiers today at an accuracy within plus or minus 2%. Rectifiers today can also be compounded, or even over-compounded, similar to M/G sets. This was not possible a few years ago.

Figure 8 is a picture of a saturable-iron core reactor control selenium rectifier for a 24 volt-6000 ampere (144 KW) rectifier.

Conclusion

From the data presented in this paper, one can foresee the potentialities in the performance characteristics of selenium rectifiers. It is the intention to continue this research investigation and test observations on selenium rectifiers for some time to come in order to determine even more accurately the actual life characteristics of these rectifiers. The contents of this paper show that selenium rectifiers properly designed and conservatively rated will last for many, many years.

Immersion "Brass" Coatings on Steel

By Hartmut W. Richter, *Supervisor, Inorganic Research, Metal & Thermit Corp.*

IMMERSION or displacement plating processes are based on the well known electromotive series in which metals are arranged in the order of their electrode potentials. Any metal in this series will, in theory at least, displace from aqueous solutions those metals that stand below it. A glance at the table as shown in abbreviated form here tells us for instance that iron will precipitate all the metals that are of interest to the plater with the exception of zinc.

Electromotive Series of Metals

Metal	*Electrode Potential*
Sodium	+2.71 Volts
Aluminum	+1.70
Manganese	+1.10
Zinc	+0.76
Iron	+0.44
Cadmium	+0.33
Cobalt	+0.28
Nickel	+0.23
Tin	+0.14
Lead	+0.12
Hydrogen	0.00
Antimony	—0.10
Bismuth	—0.23
Copper	—0.34
Silver	—0.80
Gold	—1.36

There are in use today a number of displacement tin plating processes, notably the immersion plating of copper and its alloys with tin from a potassium stannate-potassium cyanide bath, the immersion plating of aluminum alloy pistons with tin from a potassium or sodium stannate bath and the immersion plating of steel with tin and copper from a stannous sulfate-copper sulfate bath. This article concerns itself exclusively with the last process which is probably the oldest one in existence since it has been practiced in the wire industry for nearly a hundred years.

This process is known to many platers as "brass" on steel, merely to indicate that the color of the deposit resembles that of brass, a copper-zinc alloy. Actually the deposit obtained is a true bronze inasmuch as it is composed of tin and copper. Recently, the less misleading term "straw color" finish has been introduced, the only drawback of which lies in the fact that the colors obtained are often very far over on the coppery side. In the wire industry all tin and tin-copper coatings on steel obtained by immersion plating are still referred to as "liquor finishes." This confusing bit of terminology originated in the days of yore when the wire drawer added sour beer or "liquor" to his laboriously prepared tin sulfate-copper sulfate solution because he had found that its addition made better wire. Although the word "liquor finish" has persisted, modern technology not only has done away with the need for sour beer but it has all but swept out the old and inefficient method of preparing tin sulfate *in situ* from a mixture of flake or feathered tin and a solution of copper sulfate according to the equation:

$$CuSO_4 + Sn \rightarrow SnSO_4 + Cu$$

or, in ionic terms:

$$Cu^{++} + Sn \rightarrow Sn^{++} + Cu$$

In this reaction the copper precipitates on the tin, thereby soon rendering the latter inactive. As a result, the process is difficult to control and wasteful of tin and copper, besides requiring the handling of a metallic sludge. For a number of years now, the plater has had available to him tin sulfate (stannous sulfate) as a commercial chemical by means of which solutions of the desired concentration can be prepared rapidly, exactly and without waste.

A fortunate aspect of the co-deposition of tin and copper on steel from mixed solutions of tin sulfate and copper sulfate is the fact that it takes place readily and with sufficient rapidity at room temperature. This holds true even for solutions containing only one part of copper for every hundred parts of tin. When copper is totally absent, however, the solution must be heated for a considerable length of time near its boiling point before tin exchanges for iron with the formation of a silver white coating known in the wire industry as "white liquor finish." Coatings obtained from solutions so low in copper as to be nearly colorless already have a definite straw color, which is indicative of the fact that the deposit always contains more copper in relation to tin than does the solution from which it was obtained. Thus a solution containing 3 oz./gal. stannous sulfate and 1 oz./gal. copper sulfate, which represents a tin to copper ratio of six to one, will deposit an alloy containing the metals in a ratio of one to three.

Solution Preparation

The composition of the plating solution may be varied over a considerable range without too much effect on the color of the deposit but it must, nevertheless, be controlled to obtain consistent results. Furthermore, too much copper in the deposit resulting from a solution depleted in tin or too rich in copper may not only yield a deposit of too coppery a color but also one that is not sufficiently adherent. The best practice is to build the solution around an arbitrary tin level that is

consistent with economy, frequency of replenishment and rate of deposition and to dissolve in it as much copper sulfate as is needed to produce the desired color. The solution must also contain some sulfuric acid. One that will probably answer most purposes has this composition:

Copper sulfate ($CuSO_4 \cdot 5H_2O$)	6 oz./gal.
Stannous sulfate ($SnSO_4$)	1-3 " "
Sulfuric acid (66° Bé.)	3 " " (equal to about 2% by weight of H_2SO_4)
Operating conditions	30 sec. to 2 minutes at room temperature.

Additions to the solution must be made to compensate for the metal removed by plating and lost by drag-out. Rinse waters, however, should not be returned to the plating tank since the drag-out is depended upon to keep the iron concentration in the plating solution down. Because copper is carried at a lower concentration than tin and, because it is plated out at a faster rate, control of the amount of copper in solution is of particular importance. Whenever an addition of either tin sulfate or copper sulfate is called for, good practice dictates that the chemicals be predissolved in a small portion of the plating solution (always at room temperature, never hot) so as to insure perfect mixing. Unless this is done copper sulfate, which dissolves only very slowly in cold solutions even when the recommended small crystals are used, will invariably be found at the bottom of the plating tank and give rise to streaky or unevenly colored deposits. For large consumers operating 24 hours a day, the use of stock solutions is very advantageous. The preparation of such stock solutions is fully described in the commercial literature.*

In common with other plating solutions, tin sulfate-copper sulfate immersion plating solutions will produce a certain amount of sludge in time. Solutions which are operated intermittently will produce more sludge per unit of work than those operated continuously. The sludge, however, does not normally interfere with satisfactory operations. Where and when it appears to be excessive it is advisable to allow the solution to settle overnight after which time the clear liquor may be siphoned off for reuse. If preferred, sludge may also be removed by intermittent or continuous filtration.

As in all plating processes, the article to be coated should be clean. Standard cleaning methods, either acid or alkaline or a combination of both, are applicable. The plating operation itself may be carried out in equipment made from any material resistant to the combined action of dilute sulfuric acid and tin and copper sulfates at room temperature. A wide range of materials satisfies this requirement, among them rubber, plastics, lead and tile-lined steel, chemical stoneware, lead-lined wood or even plain redwoods. In addition to rubber, a number of proprietary materials are available that can be applied to mild steel and which are resistant to the plating solution.

*Data sheet #110 available from Metal & Thermit Corp., 100 East 42nd St., New York 17, N. Y.

Analytical Control

STANNOUS TIN

Dissolve 1.5 g. of mercuric chloride in 50 ml. of HCl solution (10:90), then pipette 10 ml. of the sample or an amount which does not contain more than 80 mg. Sn^{++} and allow it to drain into the mercuric chloride solution. The tip of the pipette should be immersed under the solution to prevent oxidation of the stannous tin. The solution should be stirred as the sample is being added. Remove the pipette, rinse down the outside with a small amount of water and dilute the solution to 100 ml. Stir, allow to settle for 30 minutes and filter by suction on a Gooch crucible. Wash beaker and crucible three times with HCl (1:4) and then 4 times with hot H_2O. Dry for ½ hour at 105°C. Weigh and heat for an additional 15 minutes to check the weight. The drying of the mercurous chloride should not be unduly prolonged.

$$SnSO_4 \text{ (oz./gal.)} = \frac{\text{weight of HgCl. in mg.} \times 0.06275}{\text{ml. of sample}}$$

Ref: Determination of Tin with Mercuric Chloride. J. G. Fairchild. Ind. Eng. Chem., Anal. Ed. **15**, 625-6 (1943).

COPPER

1. *Standard Copper Solution* (1 ml. = 0.4 mg. Cu). Dissolve 0.4 g. of pure copper in 100 ml. HNO_3 (5:95). Bring to a boil and boil gently to remove oxides of nitrogen. Cool, transfer to a one liter volumetric flask, dilute to mark and mix well.

2. *Thiosulfate Solution* (0.025 N). Dissolve 6.205 g. of $Na_2S_2O_3 \cdot 5H_2O$ in water, dilute to one liter in a volumetric flask and mix well.

3. *Starch Solution* (10 g. per liter). For each 100 ml. of starch solution required, make a paste of 1 g. of soluble starch in about 5 ml. of water and add this to 100 ml. of boiling water. Boil for about 5 minutes or until the solution is clear. Cool before using and prepare fresh every day.

4. *Standardization of Thiosulfate Solution.* Pipette 25 ml. of the standard copper solution (1 ml. = 0.4 mg. Cu) into a 250 ml. Erlenmeyer flask. Add ammonium hydroxide drop by drop (swirl solution after each drop) until the solution just turns blue. Add 2 g. ammonium bifluoride and swirl to dissolve. Add 2 g. potassium iodide, swirl to dissolve, add 5 ml. of starch solution (10 g./l) and titrate with the thiosulfate solution to the complete disappearance of the starch-iodine color. (When the color begins to fade, the thiosulfate should be added dropwise and the solution swirled well after each drop until a drop completely destroys the color. After the color has been discharged, it should not return within 10 minutes.)

Copper equivalent of $Na_2S_2O_3$ solution in grams per ml. =

$$\frac{0.01}{\text{ml. of thiosulfate}}$$

5. *Determination of Copper.* Pipette a 2 ml. sample into a 250 ml. Erlenmeyer flask, add 25 ml. H_2O, 2 ml. HNO_3 and a few glass beads and bring to a boil. Boil for 5 minutes to remove oxides of nitrogen, cool

(*Concluded on page* 76)

Pickling and Bright Dipping of Copper and Copper-Rich Alloys

By E. E. Halls

THE acid treatment of copper and copper-rich alloys in the form of raw material, *i.e.*, sheet and strip, rod and wire, tube and section, is generally established so that sound practices are operated under controlled and economic conditions. These acid treatments are required after heat treatment processes and prior to subsequent mechanical operations of rolling, drawing, extruding, etc. The object of the treatment is to remove superficial oxide, which may range from tarnish film to heavy black scale, without unnecessarily attacking the base metal. The latter is essential because dissolution of metal itself means loss of metal, wastage of acid, and probable damage to the surface by irregular attack and pitting. The removal of oxide is imperative because otherwise it would be rolled or drawn into the metal surface and result in material imperfections which would jeopardize the successful fabrication of components from it; such inclusions would also result in a low level of service performance. Again, a relatively bright appearance is necessary in much of this metal, and bright acid treatments are given under similarly controlled conditions.

In a metal mill, the problem of acid cleaning is often eased by virtue of the fact that only one type of product has to be handled, and its condition is relatively uniform, so that a process and plant can be installed and controlled to deal with it in a relatively simple manner. Thus a typical practice for brass is to pickle, after annealing, in 10% sulphuric acid solution, regenerating by electrodeposition of the copper, and to use 10% sulphuric acid with the inclusion of 3% of potassium dichromate for removing copper stains and brightening the brass surface. In short, a process is standardized that is the most economic from all standpoints, and simplest from the points of view of plant construction and fume and exhaust problems.

The problem in a metal finishing department dealing with a miscellany of components for further press shop operations or for plating, enamelling or other finishing processes is very much more complex. Nevertheless, it has to be solved and established upon the same fundamental basis as for the raw material. Specific treatments are essential for ensuring satisfactory finishes, and it behooves the practical man to obtain the desired results by using available acids most judiciously, but this can only be achieved by grading jobs and work through the most economical but appropriate acid treatments.

The following attempts to review established processes in relation to components and material, and to formulate recommended procedures for the wide range of copper-rich non-ferrous metals which pass in the form of components through the plating rooms of manufacturers or job shops.

Reprinted from Electroplating.

General Survey of the Problem

Nitric and sulphuric are the principal acids used for cleaning copper-rich alloys; hydrochloric, chromic and phosphoric acids are employed to a lesser extent, or as minor although perhaps important components of acid mixtures. The copper-rich metals referred to embrace the copper (*i.e.*, copper itself, tellurium-copper, chromium-copper and arsenical coppers); the beryllium coppers (principal alloy having 2% beryllium); the brasses (ranging from the extruded and free-cutting leaded alloys of approximately 57% copper content, through the 70/30 alpha brasses, to the gilt metal types of 85 to 95% copper content); the bronzes (tin bronzes of tin content from 4 to 10% and aluminum bronzes containing up to 10% aluminum); the gunmetals (typified by the alloy 85% copper, 10% tin, 5% zinc); the nickel silvers (varying from 8 to 25% nickel content); and the cupro-nickels containing from 20% upwards of nickel.

These metals are not attacked by dilute sulphuric acid, which forms the most satisfactory basis for a pickle to remove scale as well as light oxide films. They are, however, attacked by dilute sulphuric acid containing oxidizing agents such as chromic acid, dichromates, or ferric sulphate, so that controlled additions of this nature serve a useful purpose for removing copper stains from the pickled work, or for brightening it.

Nitric acid of strength, ranging from dilute to concentrated, vigorously attacks all these non-ferrous metals, and is used as the basis of rapid cleaning solutions and particularly for "bright" dips. Sulphuric acid exerts a restraining influence on this rapid action, so that most bright dips are primarily nitric/sulphuric acid mixtures.

The bright dips fulfil an important role as a preparatory treatment of copper-rich alloy components for electroplating. Their use is the plater's method of assuring good adhesion of the electrodeposit, particularly nickel. In the general industrial plating shop, handling miscellaneous components varying in shape and size, thickness of base metal and form, *i.e.*, castings, stampings, blanks and machined articles, this practice is a sound one.

In fabricating shops, much annealing is entailed

TABLE I

Tests on Removal of Black Scale from Precipitation Heat-Treated Beryllium Copper

Test	Solution	Temperature °C.	Time
A.	10% vol. sulphuric acid	90/100	Few Seconds
B.	"	50/60	Up to 2 mins.
C.	"	Room	Up to 30 mins.
D.	25% vol. sulphuric acid	90/100	Immediate.
E.	"	50/60	As B.
F.	"	Room	As C.
H. I, J.	75% vol. sulphuric acid	As D, E, F.	As D, E, F.
K.	Bright dip: 3 vols. nitric and 1 vol. sulphuric followed by 1 vol. nitric and 3 vols. sulphuric	Room	Ineffective.
L.	10% vol. sulphuric acid, plus 10% copper sulphate	Room	Ineffective.
M.	5% vol. sulphuric acid plus 3% postassium chromate	Room	Not completly effective.
N.	50% vol. sulphuric acid, 25% vol. nitric acid, 0.1% vol. hydrochloric acid, remainder water	Room	Ineffective.

between severe drawing operations, and acid treatments are necessitated before the subsequent drawing processes. When the heat-treatment is carried out in furnaces not provided with controlled atmospheres, or local annealing for bending is practiced, black scaling results. Even when controlled atmospheres are employed, so that no blackening of the surface of the metal results, the volatilization of zinc from brass surfaces results in a surface condition unsuitable for drawing, although this may be rectified by a rinse in cold 5% sulphuric acid for a second or so. It is for this cleaning after heat treatment that the nitric acid-rich type of bright dip solution is quite unnecessary, and in fact damaging as well as wasteful. It is in fact surprising, even today, the extent to which, for example, mixtures of concentrated nitric and sulphuric acids are used wrongly for this purpose.

Broadly considered, the acid treatments may thus be grouped in two categories, *viz.*:

(a) For general cleaning, including the removal of heat treatment scale.

(b) For the final operation, either as a preparation for plating or as an actual bright finish.

Sulphuric Acid Dips

The response to acid treatment of all the copper-rich alloys mentioned above is closely similar, with some reservation in the case of beryllium copper and aluminum bronze. In the following, therefore, the case of brass, which is the metal of most general interest, will be discussed, and any necessary modifications given later for the other metals.

The recommended process for cleaning brass to remove oxide, tarnish and scale, *e. g.*, after annealing, uses sulphuric acid, 5% by volume. If a heavy load of scaled work is passed continuously through a pickling tank of small capacity, 10% by volume for the initial make-up is sometimes used, with additions of fresh acid as the concentration falls to the 5% level.

For the bright annealing of brass from controlled atmosphere furnaces, parts emerge in colors that may be slightly grey or somewhat coppery. For this work, the pickle can be operated quite satisfactorily at room temperature with an immersion time of a few seconds.

Again, even in modern engineering factories, much brass is annealed in gas or electric muffle furnaces without an artificial gas atmosphere, and it is quenched from the annealing temperature "to loosen" the black scale. The pickling time for this in cold 5% sulphuric acid is upwards of 20 minutes and, consequently, a hot pickle is advocated to speed the process. A temperature of 140—160°F. is suitable, and the time is reduced to the order of 1 minute.

The sulphuric acid when diluted does not attack the base metal, and consumption is that required to dissolve the tarnish and oxide scale plus losses due to drag-out. The "clean" annealed components therefore use very little acid, and the 5% bath has a long life. The "black" annealed work uses appreciably more acid on account of the heavy scale, and baths have a shorter life. To avoid very frequent adjustments to heavily worked baths, an acid concentration of 20% by volume is frequently used and justified for this reason. The drag-out volume of hot acid is lower than that of a cold solution on account of lower viscosity and quicker drain-down rate, but, nevertheless, the quantity of acid in the drag-out loss is greater for the 20% pickle than it is for the 5% solution.

Dichromate/Sulphuric and Nitro-Sulphuric Dips

The appearance of the brass after these treatments depends upon its initial condition, and it may still be somewhat greyish, or it may have copper stains at heavily dezincified areas. This appearance does not detract it any way from the quality of the component in its performance under subsequent machine operations of deep drawing, bending, etc. However, many people insist upon a uniform brassy yellow color of some lustre. This can be provided by a further acid treatment at room temperature in dilute sulphuric acid containing an appropriate oxidizing agent. This solution does slowly attack the base metal, rapidly if used hot, so that the time of immersion needs to be controlled to the necessary minimum. This is not merely on account of the slight reduction in dimensions but more to avoid unnecessary consumption of

chemicals, particularly the oxidizing agent, which is relatively expensive. For the same reason, it is imperative not to allow metal chips to contaminate the pickle, thereby wastefully degenerating it.

The recommended solution of this type, and the most generally used, is 5% by volume sulphuric acid plus 3% by weight potassium dichromate. Sodium dichromate may substitute for the latter, or it may be replaced by 2% chromic acid. An alternative bath is 10% sulphuric acid by volume and 9% ferric sulphate by weight.

It is evident that it is best practice to treat the work in the straight sulphuric acid pickle first, and then dip for a few seconds in the brightening solution. It is permissible to do this without an intermediate rinse if desired. On the other hand, "clean" annealed work may be treated in the sulphuric acid/oxidizing agent solution only if the extra expense is permissible, but the heavily scale work should be treated through both baths.

Work from annealing requires no degreasing (unless accidentally contaminated by oil, for example, from dirty boxes) prior to acid treatment but, when these treatments are used at other stages for cleaning and/or brightening, the work should be cleaned first by solvent (*e.g.*, trichlorethylene) or aqueous alkaline cleaner. After the acid treatment, the work should be washed in cold and hot water, and dried-off. Oil and grease naturally retard the action of the acid and destroy the oxidizing agent. Dichromates are particularly susceptible to this organic contamination, and, when sulphuric/dichromate baths are used infrequently, it is advisable to provide them with a cover to give protection from atmospheric dust, which may be quite destructive.

Chemical stoneware is the best material for tanks, and the method of heating may be an outer water tank which is heated by steam coil. Alternately, for the straight sulphuric acid solutions, mild steel tanks lined with rubber, polythylene or rigid P.V.C. are very satisfactory at room temperature and reasonably long lasting up to 140°F. Lead lined tanks are also employed.

The dichromate type of treatment is not considered satisfactory as a basis for electroplating without an additional acid treatment; the chromate ion seems to passivate the surface in such a manner that best metal adhesion is not secured. A nitric or nitro-sulphuric acid dip overcomes this shortcoming (see below).

In the electrical communications industries many copper-rich alloys (*e.g.*, brass, nickel silver, phosphor bronze) terminal tags are blanked from clean strip material of very good surface condition, but they acquire a natural oxide tarnish which, although not detracting from the surface appearance, prevents, or makes very difficult, soft soldering using non-corrosive resin fluxes. This tarnish can be removed by immersion for up to 15 secs. in 5 to 10% by volume sulphuric acid at room temperature. Bright dipping in nitro-sulphuric acid is not necessary for this purpose, nor is it desirable because it roughens the surface unduly and gives a bright finish which is more susceptible to heavy tarnishing than was the original as-rolled condition.

Bright Dipping

When a truly "bright" finish is required, a nitric acid-containing solution is generally necessary. Such solutions are readily made-up to formula but, from the very nature of the operation, which entails a vigorous chemical action, they are difficult to maintain

TABLE II

Average Loss in Thickness of Various Copper-Rich Alloys, 30 seconds Immersion

Acid	Temp. °C.	Average Loss in Thickness, Inches ÷ 1,000 70/30 Brass	18% Ni Silver	5% Phos. Bronze	Copper
Nitric Conc.	Room	2.3	1.3	3.5	—
	70	7.5	12.5	7.0	—
3 vols. Nitric, 1 vol. Water	Room	2.4	2.7	1.5	—
	70	10.0	8.5	4.0	—
3 vols. Nitric, 1 vol. Sulphuric	Room	1.0	0.5	1.0	—
	70	1.2	1.0	1.8	—
1 vol. Nitric, 3 vols. Sulphuric	Room	0.05	0.2	0.1	—
	70	0.25	0.2	0.3	—
4 vols. Sulphuric, 3 vols. Nitric, 1 vol. Water	Room	0.2	—	—	—
	70	0.3	—	—	—
1 vol. Sulphuric, 1 vol. Nitric, 5 vols. Water	Room	—	0.4	0.3	—
	70	—	0.6	0.5	—
1 vol. Sulphuric, 9 vol. Water	Room	Nil	Nil	Nil	Nil
	70	Nil	Nil	Nil	Nil
1 vol. Sulphuric, 19 vols. Water, 3% wt. Potassium dichromate	Room	Negligible	Negligible	Negligible	Negligible
	70	Negligible	Negligible	Negligible	Negligible

TABLE III

Loss in Weight (mg./sq. in.) of Various Metals, 1 Hr. Immersion

Acid Solution	Brass	Copper	Aluminum	Mild Steel	Stainless Steel	Monel Metal
10% vol. Sulphuric acid	Negligible	Negligible	0.10	6.0	1.0	Negligible
5% vol. Sulphuric acid + 3% potassium dichromate	50.0	51.0	0.32	—	Negligible	42.7
10% vol. Sulphuric acid + 10% ferric sulphate	57.5	53.0	0.35	—	Negligible	51.0
40% vol. Sulphuric acid + 7% vol. nitric acid + 1% sodium chloride	—	—	—	40.0	Negligible	61.5
5% vol. Sulphuric acid + 3% potassium dichromate	—	—	7.5	—	Negligible	170

All solutions at room temperature except last, used at 70° C.

chemically. In conjunction with this, must be considered the variety of brasses varying in composition, some leaded, and in form, some cast, some extruded and others machined or stamped. Bright dipping thus entails considerable skill, particularly when brasses, bronzes, coppers, and nickel silvers go through the same plant. Quick dips are imperative, and they are done manually, handling the work in baskets; light parts often float on the acid foam which is produced by the rapid fuming upon dipping. Consequently the whole basket load may not be uniformly treated, with the result that several successive dips are given. Dimensions may thereby suffer severely, especially if maintenance of the dip has been by uncontrolled additions of nitric acid. This is a feature demanding serious consideration from the viewpoints of whether the type of component can withstand the type of treatment, and the degree of process control to be exercised.

It is considered that miscellaneous work for bright dipping should be brought into as uniform a surface condition as possible before treatment. Heat treated components, those scaled by annealing operations and by brazing, and those blackened or corroded by long exposure or adverse conditions, should preliminarily be treated by the above described plain sulphuric acid treatment. Again, as for the latter, oil, soap greases, chips and any extraneous contamination must be removed by degreasing and cleaning operations.

The nitro-sulphuric acid bright dips are operated at room temperature, except insofar as the solution rapidly heats from the vigorous reaction with the metal. Some control is exercised over this by having the acid mixture in a stoneware tank surrounded by an outer tank through which cold water continuously flows. This outer tank serves for the first rinse.

The presence of the sulphuric acid greatly suppresses the vigor of the reaction and is a useful control feature. One process uses two successive dips in concentrated acid mixtures, each comprising only a few seconds. The first dip, which gives the more vigorous attack, uses a mixture of 3 vols. of nitric and 1 vol. of sulphuric acid. The second uses a mixture of 1 vol. of nitric acid and 3 volumes of sulphuric acid. The full sequence of operations is as follows:

1. First bright dip.
2. Cold water rinse.
3. Second bright dip.
4. Cold water rinse.
5. Second cold water rinse.
6. Rinse in cold 5% sodium cyanide solution.
7. Cold water rinse.
8. Hot water rinse.
9. Dry off.

It will be noted that no water or chloride is included in either of these dips, and consequently the "finish" produced is not so rich as when these are present. Some water is carried over in the second dip, however, from the cold water rinse. The cyanide rinse removes any acid stains produced between operations 5 and 6. Some plants use a solution of about 2% cyanide and 1% soap at this stage. This is risky because, if traces of acid are still present, for example, from recesses, a fatty film is deposited, which may upset electroplating should such be contemplated. It is, therefore, preferred to add this as an additional operation after No. 6. Reports from practice say it is very beneficial in spite of the subsequent water rinses) in retaining brilliance until subsequent lacquering or plating.

More frequently a single acid mixture is used, and this contains some water and often some chloride as salt or hydrochloric acid. A double dip is given with a water rinse interposed, the immersion time varying with the nature of the work. Formulas for this mode of operating can be quoted from practice as follows, the value being percentages by volume:

	1.	*2.*	*3.*
Sulphuric Acid	25	40	60
Nitric Acid	70	20	30
Hydrochloric Acid	None	None	1
Water	5	40	9

In practice, these dips are difficult to control by analysis because they change so rapidly as work is passed through them. Consequently, they are usually kept going till spent by additions of nitric acid. The higher sulphuric content solutions are preferred for minimum reduction of dimensions of the part, and Nos. 2 and 3 are advocated, both giving excellent bright finishes. They are also suitable for the final acid treatment prior to plating, and may be used to counteract the effect of the sulphuric acid-dichromate pickle when this has been used in a previous cleaning operation.

The nitric-containing solutions all need the provision of an excellent exhaust to remove the highly corrosive and toxic fumes evolved. On the contrary, the sulphuric solutions dealt with earlier only need exhaust when employed hot, and then only to remove steam. They do not present the same dermatitis hazard to operators, nor corrosiveness to plant.

The nitro-sulphuric dips, unless very closely controlled for composition (particularly in relation to nitric acid content) and immersion time, will tend to give a relatively rough surface condition.

This is particularly noticeable on brass stampings from material of coarse grain, or material coarsened by overheating in annealing operations.

Hydrochloric Acid Pickles

Hydrochloric acid solutions are used for removing tarnish or scale, and as a preparation for plating. They are not advocated in place of the sulphuric acid solutions for several reasons: they are used at higher strengths, often concentrated, so consumption, including drag-out losses, is greater; they attack the base metal and may etch it unduly; while the solutions should be exhausted because the fume is very corrosive to adjacent equipment. They can, however, be used instead of nitro-sulphuric treatments when brightness is not required, *e.g.*, as a pretreatment for plating. The adhesion of electrodeposits is generally deemed to be inferior to that obtained when nitro-sulphuric dips are employed. The concentrations employed for the classes of work mentioned range from 35-100% by volume.

Phosphoric Acid Mixtures

Nitric/sulphuric/phosphoric acid mixtures are employed to some extent for bright dipping and preparatory to plating. Solution compositions range from equal volumes of the three acids to 36% nitric acid, 50% sulphuric acid, 14% phosphoric acid. The absence of water and chlorides will be noted. These triple acid solutions are said to be satisfactory for use prior to electroplating. In Great Britain, to avoid the use of sulphuric acid, hydrochloric/phosphoric acid mixtures are being used for bright dipping prior to plating but they are not sufficiently developed to give final details. One composition employed comprises 8 vols. of concentrated hydrochloric acid and 1 vol. of phosphoric acid; it is operated warm (100-110°F., 38-43°C.) with immersion times up to 3 mins.

Exceptions or modifications to the above procedures for copper-rich metals other than brass are given below.

Nickel Silvers and Aluminum Bronzes

The nickel silvers closely follow the brasses in performance, except that pickling after heat treatment may be a little slower in the dilute acid solutions. After annealing in furnaces without a controlled atmosphere, they are covered with a fairly tenacious black oxide film which is slow to dissolve in cold dilute sulphuric acid. The 5% sulphuric acid/3% potassium dichromate pickle cleans such work without damage to the base metal within 10 mins. at room temperature. An alternate pickel is 15% by volume of each sulphuric and nitric acids in water at room temperature; the pickling time is up to 5 minutes.

Aluminum bronze or (leaded aluminum bronze) containing about 10% aluminum, acquires a tenacious oxide film of greyish color. This requires long soaking in the cold dilute sulphuric acid for its removal and, for reasonable speed, the pickle should be hot and more concentrated; a strength of 20-25% by volume at 60-70°C. is recommended. This difficulty may be entirely overcome by using hydrochloric acid at room temperature. Concentration may range from 50-100% by vol., and immersion times from two to five minutes. Very satisfactory results are obtained without undue etching or attack on the base metal.

Beryllium Copper

Beryllium copper is the other exception, and a very important one because this metal is expensive and in short supply. It is often used in thin gauges for important components such as springs and moving electrical contacts. Retention of the original smooth surface of the material is important in these applications, and irregularities such as those caused by acid pitting are detrimental since they promote points of weakness at which mechanical or electrical failure can occur.

Rarely are controlled atmosphere furnaces utilized when heat treating beryllium copper components. In annealing, the parts are soaked at about 800°C. for 20-30 mins. and quenched in water. A heavy black scale is formed which is not entirely avoided by using a salt bath for the heat treatment. The alloy is chosen because it can be precipitation hardened, whereby complex shaped components can be made from soft material with intermediate annealing and the finished component finally hardened. The hardening operation

TABLE IV

Nitro-Sulphuric Dips Containing Chromic Acid

Solution Composition:	(1)	(2)	(3)	(4)
Sulphuric acid, ml.	80	65	65	65
Nitric acid, ml.	20	35	20	65
Chromic acid, g.	60	10	10	10
Hydrochoric acid, ml.	1	1	1	1
Water, ml.	200	150	120	150
Performance:				
Gas Evolution	Negligible	Slight	Negligible	Negligible
Results on brass	Slight satin effect	Very slight satin effect	Very bright, very uniform	Very bright, some streakiness

involves soaking for up to 2 hours at 300 to 320°C., quenching in water. The black oxide film that forms in this process is still tenacious, though thinner than that produced in the annealing treatment. It can be largely avoided if a salt bath is used as the heating medium.

It is most important that these black heat-treatment films be completely removed, before subsequent operations of further shaping or electroplating, by mild treatments to prevent surface roughening. Since the nitro-sulphuric acid bright dips are ineffective in removing the black scale, even if chlorides are included, the following procedures are recommended:—

(a) The black scale should be removed in dilute sulphuric acid, 10% by vol., the rate of cleaning depending upon the temperature. For the lighter scales (*e.g.*, from the hardening operation), the immersion time ranges from 20 minutes at room temperature, to 2 minutes at 50-60°C., and a few seconds at 90-100°C. For heavy scales (*e.g.*, from the annealing process), pickling times are excessive in cold solutions, and processing at more elevated temperature becomes essential in commercial practice. The intermediate temperature may be used, but cleaning is rapid at 90-100°C.

This pickling removes all the oxide without attack on the base metal, but leaves the work dull, with irregular coppery stains.

(b) To brighten the work from (a) and to yield a uniform color, it should be immersed for the minimum time (max. 2 mins. is satisfactory) in 5% by vol. sulphuric acid and 3% by weight potassium dichromate at room temperature. This solution has a slight action on the base metal and should not be employed until all the black scale has been completely removed a under (a). Otherwise, irregular pitting will result.

(c) The dichromate pickle prevents good adhesion of electroplated coatings, and, therefore, prior to electroplating, a quick dip by one of the nitro-sulphuric acid processes is imperative.

In Table I are given a few test results summarizing times for removing the black scale from precipitation heat-treated beryllium copper parts in illustration of the above.

Attack on Copper and Copper Alloys

The attack of some of the acid solutions discussed is shown in Table II by the average loss in thickness upon immersion for 30 seconds of metals selected from the range considered. The data were derived from weight losses from a large number of specimens computed to reduction in thickness from density values. In practice, considerable variation may be expected because surface condition, shape, size and other factors have to be considered. Further, preferential attack often occurs at edges and corners.

The general trend of the figures is approximately the same for all the copper-rich metals given. Temperature generally increases attack, while sulphuric acid suppresses the action of nitric acid appreciably. The possibility of excessive dissolution obviously has to be considered with some of the solutions if components are made to close dimensional limits.

Another point to be given thought in this direction is the material for the baskets for holding small components when operating continuously. Brass or copper are quite satisfactory for straight dilute sulphuric acid solutions, but not entirely for those having additions of oxidizing agents such as dichromates; they are not satisfactory for the nitro-sulphuric solutions. Aluminum gives quite good service for these groups. Table III gives data appertaining to this feature, confirming these statements, and also including the performance of stainless steel (18/8) and Monel metal. It shows that Monel metal is quite suitable for plain dilute sulphuric solutions and entirely unsuitable for those containing oxidizing agents, whereas stainless steel possesses the reverse qualities, *i.e.*, it cannot be employed with plain sulphuric acid solutions but gives excellent performance with the dichromate and nitric acid mixtures.

Chromic Acid-Containing Nitro-Sulphuric Dips

Another type of nitro-sulphuric bright-dip solution worthy of mention contains chromic acid with the object of oxidizing the oxides of nitrogen as they are formed and so conserving nitric acid as well as improving operating conditions. This type of mixture has been known for a long time but work on commercial development has not been wide. A composition has to be found that yields a really bright finish, free from streakiness or satin-like areas, and a method of maintaining this under continuous production conditions on a miscellany of work has to be established. The first of these features can be achieved at least partially, the second is more difficult. In any case, the presence of chromic acid is regarded with suspicion if the dip is required prior to electroplating, as experience shows generally that chromic acid present at this stage always mitigates against best adhesion.

Wide variations are possible in the make-up of these chromic acid-containing dips and two series have been quoted as follows:—

	80/20 Series	65/35 Series
Sulphuric Acid, ml.	80	65
Nitric Acid, ml.	20	35
Chromic Acid, g.	20 to 100	10 to 20
Hydrochloric Acid, ml.	1	1
Water, ml.	100 to 200	100 to 150

They are operated at room temperature with very short immersion periods because they are as fierce on the metal as the nitro-sulphuric solutions. Brief comments from tests made on solutions from this range are given in Table II.

The third of these solutions gave easily the best results, and a practical formula may therefore be cited for a fumeless dip, as follows:

Sulphuric Acid	65 gal.
Nitric Acid	20 gal.
Chromic Acid	100 lb.
Hydrochloric Acid	1 gal.
Water	120 gal.

The hydrochloric acid is an essential in this for promoting uniformity of etching and brightness. A much less elaborate exhaust system is required than for the conventional nitro-sulphuric dips, it only being required to take away the fume of the strong acids, particularly at make-up times.

Western Metal Show and Congress Most Successful in Recent Years

By Fred A. Herr, *Pacific Coast Editor*

PRONOUNCED the most successful and best attended of the various such affairs held on the Pacific Coast in recent years, the Eighth Western Metal Congress and Metal Exposition closed in Los Angeles, Calif., on March 27 after a five-day run, with overall attendance pushing the 45,000 mark.

The Congress and Show were presented under the auspices of the *American Society for Metals* in collaboration with the western branches of eleven other technical societies active in the fields of metal production, fabrication, treatment, preservation, finishing or processing.

The meetings of the Metal Congress were held at the Hotel Statler in downtown Los Angeles from March 23 through the 26th, while the Show was in progress in Pan Pacific Auditorium, across town, from the 23rd through the 27th.

The deliberations of the four days of the Congress were concentrated heavily on two of the newer metals, zirconium and titanium. Three half-day sessions were devoted to zirconium, one to titanium and two to general metal research discussions. Twenty-one papers were presented on the subject of zirconium. They covered every aspect of this metal, from ores on, and including fabrication of zirconium, alloying, precipitation hardening, hydrogen embrittlement, procedures for metallography of zirconium, zirconium-tin, zirconium-nickel and manganese, corrosion resistance of zirconium and its alloys, and other aspects. The list of speakers, on this and other subjects, literally represented a page from the Who's Who of American metallurgical technocracy.

The next important subject on the Congress' agenda was titanium, on which seven papers were presented. Two full afternoon sessions were devoted to general research subjects dealing with metals, at which ten technical papers were presented on such varied phases of research as precipitation hardening, properties of hydrogen-sintered binary alloys, tensile properties of aluminum-copper alloys etc.

Allied societies which held one, two or three-day technical conferences during the same week included the *American Welding Society, Society for Non-Destructive Testing, American Institute of Mining and Metallurgical Engineers, American Foundrymen's Society, Society of Automotive Engineers* and *American Society of Tool Engineers.* The *American Electroplaters' Society* timed its annual educational session for the Saturday preceding the opening of the Metal Congress; and the *American Chemical Society* met in a three-day conference March 17th through 19th, also at the Statler Hotel.

New records for attendance and number and variety of exhibitors were set at the Metal Exposition. Annexes to the Pan Pacific Auditorium in the form of circus tents were required to accommodate the overflow of the more than 400 exhibit booths. A number of the exhibits were sponsored by manufacturers and distributors of machinery, equipment, chemicals, processes and technical services employed in the metal finishing industry.

Among finishing industry exhibitors, products displayed and company personnel in attendance, were the following:

F. E. Anderson Oil Co., Inc., Portland, Conn., presented a display of metal working solutions, rust preventives, government specification lubricants and machine cleaners. The firm features a complete rust protection service from laboratory to final packing. Distributed from this firm's booth was a chart of rust preventatives meeting U. S. Government specifications. Comprising the Anderson delegation at the Metal Show were *F. E. Anderson*, pres., *T. C. Bradford*, sales engineer, and *M. S. Phoenix*, chief tool engineer, all of Portland; and *W. J. Trevithick*, sales manager at Los Angeles.

Applied Research Laboratories, Glendale, Calif., presented operational demonstrations of a complete spectrographic laboratory suitable for a research or routine control laboratory. In attendance were *R. T. Jones*, sales manager, *C. G. Gieszl*, and *Ray Ravenelle*, installation engineers, and *Robert F. Feland* and *William C. Whelchel*, sales engineers.

Baron Industries, Los Angeles, featured a barrel degreaser, a gas-fired combustion chamber, and a portable infra-red unit. Representing this firm were Los Angeles sales engineers *James Horton, Ernest*

Roehl, F. H. MacQuarrie, John T. Hogan and *William R. Hamilton.*

G. S. Blakeslee & Co., Chicago, Ill. displayed a single stage cabinet washer for removing quench oil from parts prior to drawing, and a new single vapor spray degreaser. The firm produces solvent degreasers of many types designed for vapor spray or immersion phases for special applications, also conveyorized units. Heading the Blakeslee delegation was *H. N. Arnold*, sales manager from Chicago, plus *Barrie Stewart* and *R. H. Lanz*, Los Angeles sales engineers, and *R. A. Hamilton*, Los Angeles, field engineer.

Despatch Oven Co. Minneapolis, Minn. sponsored a booth in which literature pertaining to the firm's line of heat processing equipment was distributed. The company manufactures ovens for baking finishes, for baking, drying and curing, foundry cores and molds, insulating varnishes on electrical coils, armatures, transformers, porcelain frit, ceramics, pigments, curing rubber and various chemicals. In attendance from the main office were *C. P. Doherty*, president, and *Ray Larson*, sales manager; and regional representatives *T. Jarrett* (Denver), *L. Smith* (Los Angeles), *W. Matheson* (San Francisco), and *B. Farnes* and *R. Martic* (Portland, Ore.).

Detrex Corp., Detroit, Mich., demonstrated a new ultrasonic cleaning process for removal of soil from metal products, making use of solvent and sound waves. The new and revolutionary degreasing machinery and compounds attracted wide attention at the show. The demonstrations were conducted by *L. Camel*, sales manager, and *Stuart Millar*, assistant service manager of the Detrex Detroit office, who had collaborated in presenting a similar demonstration at the annual Educational Session of Los Angeles Branch of the A.E.S. on March 22.

Detrex personnel present, in addition to Camel and Millar, included *W. H. Newberry*, director of sales, *R. H. Allgood*, director of pub. rel., and *D. E. Willard*, sales manager, all from Detroit; *R. B. Carlisle, R. W. Clark, T. D. Lendzion* and *M. L. Crandall*, Los Angeles; *T. M. Shanley*, Whittier, Calif.; and *G. A. Jacobs*, regional manager at Los Angeles.

Diversey Corp., Chicago, presented a unique heavy duty soak tank metal cleaner and displays of an alkaline etching compound for aluminum alloys. Distributed were case histories citing outstanding performances of the latter. *B. B. Button*, Chicago, general sales manager, headed the group, which also included *R. L. Shannon*, metal industries department manager, and *C. F. Wentworth, C. R. Hardy, J. Moffett* and *W. J. Saunders.*

Electrolizing Sales and Tools, Inc., Los Angeles. *David B. Grant*, president and general manager; sales manager *Vernon Faxon*, and sales engineers *F. M. Becker* and *U. S. Altman* formed an effective team that presented demonstrations of Electrolized taps, drills, reamers, countersinks and end mills; electrolized aircraft, hydraulic, electronic component parts, tool bits, chucks, pistons, crankshafts and other items treated with the process. On exhibit also were displays showing a new drill-tap, wheel dresser, and abrasive file.

Hammond Machinery Builders, Inc., Kalamazoo, Mich. This firm displayed rotary automatic polishing, buffing and deburring machines; a spiral junior automatic polishing and buffing machine, variable speed polishing and buffing machines; cyclone and filter type dust collectors and miscellaneous small wheel and abrasive belt grinders and polishers. *R. N. Shaw*, manager of the automatic finishing division, and *S. H. Miller*, manager of the grinding and polishing division, were out from Kalamazoo to head the group, which also included *E. C. Hammett*, Los Angeles representative, and *Charles Weston*, the firm's Southern California sales engineer.

Harshaw Scientific, Cleveland, O., displayed, in working operation, carbon and sulfur analysis equipment, induction furnaces, analytical balances, pH meters, metallurgical microscopes, polishers and grinders. Present from the Cleveland office was sales manager *J. M. Manypenny*; and *J. H. Schering*, Los Angeles manager, and *D. W. Raworth, C. Schreck* and *R. McClure*, west coast sales engineers.

E. F. Houghton & Co., Philadelphia, Pa. In this booth, demonstrations were given of the use of a water soluble base in the operation of an automatic screw machine, using the company's soluble oil diluted 1 to 25 with water and turning out stainless steel parts on a production basis. Also demonstrated in operation in a power washer was a room-temperature cleaner combination. Literature distributed at the booth set forth that high in importance among features provided by Antisep soluble oil is the protection it affords tools and work against rusting, formerly the chief drawback of using water-oil solutions.

The Houghton group consisted of *D. J. Richards*, vice-president of sales and *D. C. Miner*, advertising manager, both of Philadelphia; *W. A. Fletcher*, western sales manager; *A. S. Horowitz*, plant manager; *James A. McElgin*, manager of metal working sales, Philadelphia; Los Angeles sales representatives, *J. A. Salzmann, J. J. McCabe, R. R. Irvin* and *W. E. Hall*; San Francisco sales representatives, *John Birmingham* and *J. L. Vieira*; *C. R. Jackson* and *W. R. Groce* of the Seattle, Wash., sales staff.

International Nickel Co., Inc., New York, exhibited an interesting variety of specimens of nickel alloys and "ductile" iron, the firm's new engineering material. In attendance from the New York office were: *R. A. Wheeler*, assistant manager; *M. J. Phillips*, assistant to manager; *H. S. Lewis*, editor of *Nickel Topics*; *W. R. Ferguson*, Shows and Exhibits; and *E. A. Tschop, J. R. Davis* and *W. Adamason*, sales engineers. Metallurgists *J. B. Morey, F. G. Sefing, A. G. Zima*, and *K. L. Clarke*, Los Angeles; *R. J. Rice*, Houston, Tex. and *J. Neemes*, Minneapolis, Minn.

Kelite Products, Inc., Los Angeles. Shown in operation was a parts washer of a new and exclusive design for cleaning and degreasing small parts, for use with the well known Kelite cold tank and emulsion type cleaning compounds. On display also was an extensive array of parts cleaned and prepared for painting, welding, plating, rustproofed and phosphatized. Distributed were bulletins and technical literature pertinent to Kelite's complete line of pH controlled cleaning compounds and equipment.

Sales promotion manager *R. Rawlings* of the Los Angeles main office headed the group, which also in-

cluded *L. Johnson*, sales manager of the aircraft division; *C. Harris* and *B. Waters*, division sales managers; and sales engineers *Gene Gauthier*, *D. Merrill*, *Al Hervey*, *Don Hunter*, *Burt Waters* and *Charles Harrison*.

National Carbon Co., New York, exhibited standard carbon brick shapes and sizes, tank linings of various sorts, particularly where corrosion is a problem; pipe and fittings for chemical processing equipment. The booth was staffed by *V. J. Nolan*, *J. R. Johnstone*, *H. V. Baker*, *R. L. Van Hohenleiten* and *E. C. Friday* of the company's San Francisco office.

Oakite Products, Inc., New York; The eye-stopper at the Oakite booth was a burnishing barrel in operation. Demonstrations were given of cleaning and etching of aluminum and removing oil and rust from steel. Booth display features directed attention to the company's Crys-Coat process for conditioning metal surfaces for adhesion of organic finishes as well as protection against undercoat corrosion where painted surfaces become scratched or gouged in use.

Manning the booth were *J. G. Leonard*, Pacific Coast division manager; *Harry Kerker*, assistant to the sales manager; Los Angeles and San Francisco sales engineers *C. A. Peterson*, *P. V. Rogers*, *T. A. Rohlfsen G. H. Boeck*, *Tex Maier*, *John Mackesey* and *J. F. Violette*.

Parker Rust Proof Co., Detroit, Mich., displayed production samples and comparative accelerated tests illustrating the effectiveness of various products, including a phosphate coating used as a base for paint on a variety of metals and their alloys, a phosphate coating for corrosion resistance on iron and steel, a wear resistant phosphate coating for bearing surfaces and combination phosphate coatings and lubricants that serve as an aid in cold forming metals of all types. Representing the company at the show were *H. J. McVey*, manager of the new products division, Detroit; *S. N. Headless*, Pacific Coast regional manager; *J. F. Leland*, assistant sales manager; *G. A. DeWitt* plant manager; and technical representatives, *D. P. Brown*, *J. E. Baxter* and *J. D. McDonough*.

Production Machine Co., Greenfield, Mass., presented demonstrations of high speed centerless polishing and finishing machines using idler backstands and abrasive belts. Shown in operation was a high-speed tube polishing machine, preparing steel tubes for chromium plating; also a duplex machine using abrasive and felt belts for centerless polishing and buffing of small cylindrical work. Present from the home office were *R. A. Cole*, vice-president; *R. B. Robinson*, sales manager; and *S. A. Macewicz*, sales and service engineer; and from the Chicago office, *F. G. Pennell*.

Sparkler Mfg. Co., Mundelein, Ill. The exhibit in this booth centered about a plating solution filter, a cutting oil filter and a sump filter. *Richard E. Shields* and *Robert M. Pace* operated the booth.

Standard Electrical Tool Co., Inc., Cincinnati, O., presented demonstrations of a combination collet and chuck two speed pedestal mounted speed lathe designed for secondary operations, such as filing, deburring, reaming on a production basis. Shown also was a variable speed buffer and polisher with contact wheel, abrasive belt and backstand; an infinitely variable speed single wheel snagging grinder designed to provide the most efficient peripheral speed on the grinding wheel at all times. Technical data, photographs and drawings of rotary automatic, semi-automatic and other production machines were available. *William A. Ferguson*, sales manager, and *R. C. Dolan*, sales engineer, were present from the Cincinnati office; *Fred G. Littlejohn* from the Los Angeles sales staff, and *Vance L. Peters* from the San Francisco staff.

Superchrome Engineering Co., Los Angeles, exhibited hard chromium plated, inside diameter oil tubes, oil plungers, aircraft parts, and hard chromium plated tools, gauges, taps, drill etc. The booth was staffed by *Kasmer F. Tarczynski*, general manager; *Louis Reed*, sales engineer; *Howard Norris*, plant manager; *Alfonso Alcantara*, supervisor of polishing; *Manuel Quinones*, plant foreman; and *Charles R. Welsh*, management.

Turco Products Co., Los Angeles, distributed literature and individual information from technical representatives on special cleaning and processing compounds for steam and cold tank cleaning, plating, flaw detecting, brightening, masking, deflocculating, corrosion prevention, passivating, electrolytic cleaning, paint stripping, degreasing, anodizing, chromatizing and rust prevention. In attendance were sales and advertising manager *C. E. Devine;* and *Joseph Hart*, *Robert Streeton*, *Harry S. Smith* and *James Sweatt* of the technical and sales staff.

IMMERSION "BRASS" COATINGS ON STEEL

(*Concluded from page* 67)

and dilute to 30 ml. While swirling the solution, add NH_4OH until a precipitate just forms. Then add NH_4OH dropwise, swirling after each drop, until a faint odor of ammonia is evident. Add 2 g. ammonium bifluoride and swirl vigorously to dissolve precipitate (about 1 minute). Add 2 g. KI, swirl for about ½ minute and titrate with thiosulfate as described under standardization.

$CuSO_4 \cdot 5H_2O$ (oz./gal.) = copper equivalent of $Na_2S_2O_3$ solution in g./ml. × ml. of thiosulfate × 0.53.

Free Sulfuric Acid

Pipette 10 ml. of the solution to be analyzed into a 500 ml. Erlenmeyer flask, dilute to 200 ml., add 2 drops methyl orange indicator and titrate with 0.5 N sodium carbonate to the appearance of a yellow color.

$$\% \text{ Free } H_2SO_4 = \frac{\text{ml. } Na_2CO_3 \times \text{Normality} \times 4.9}{\text{ml. of sample}}$$

EXTRACTS
From the World's Plating Literature

Hardness Measurements of Plated Coatings

A. Keil and O. Wuest. *Metalloberflaeche*, vol. 6, No. 7, pp. A102-A106.

A number of newly developed types of measuring equipment give to the plating industry the possibility of conducting micro-hardness measurements to an increased extent. It is necessary to observe the special laws of micro-hardness with the evaluation of the results, which up to now have been principally tested for homogeneous bodies. The object of the present work was to complete this information by some observations which were obtained on very variable plated coatings as regards mechanical properties and of variable thicknesses and to examine possible causes of error in the hardness measurements. It is intended by further research to continue this work in the direction of obtaining hardness measurements as a criterion of the special properties of plating baths, such as throwing power etc.; the above research has served for the object of obtaining preliminary data for the subsequent comparative research.

Surface Coating Protection by the Evaporation-Condensation of the Rarer Metals

Metalloberflaeche; vol. 6, No. 7, pp. A109-A110.

Numerous metals form compounds, principally chlorides, fluorides, bromides, iodides, as well as carbonyls which are volatile on heating. When heated to still higher temperatures, these volatile metal compounds decompose between a temperature range of 800°-1800°C. according to the particular metal, by which the free metal is formed in the vapor phase and, by the employment of suitable equipment, can be precipitated onto the surface it is desired to process. The semi-metals can also be treated in this manner; thus, silicon can be coated onto steel surfaces by way of silicon tetrachloride vapor. In the same way, molybdenum surfaces can be made to give several hundred hours service life at 1700°C. for such high temperature applications as jets and nozzles.

The volatile halogen compounds of the following metals have been shown to be suitable for metallizing purposes in the presence of protective gases or else in high vacuum, some only on an experimental scale at the moment: uranium, thorium, vanadium, titanium, zirconium, hafnium, molybdenum, wolfram, rhenium.

In the presence of hydrogen gas, an internal diffusion of the following metals into the base metal can be achieved, from the halogen vapor-phase compounds: tantalum, niobium, molybdenum, wolfram, boron and silicon. Metallizing for surface protection is also possible by the application of metal-hydrogen compounds (hydrides). Germanium, indium, gallium, thallium, arsenic, selenium, tellurium can be deposited in this way, not only on metal surfaces, but also on glass and other non-metallic substances. Metallized coatings can be obtained on steel from the vapor phase carbonyls of molybdenum, chromium, wolfram, which have the highest technical significance for special applications.

The metals of the platinum group also can be applied for special coating purposes by thermal decomposition of their carbonyl or halogen compounds. Organic compounds of platinum also, such as platinacetylacetonate can be used.

Easily vaporized metals such as antimony, arsenic, zinc, can be deposited from the vapor phase directly on metal surfaces. Unsuspected possibilities are offered by the production of surface coatings which can be deposited directly from the vapor phase in the form of alloys from the vaporized metal compounds. The combination possibilities in this direction are still very great and further surprises in this direction can be expected.

Black Oxide Coatings on Steel

Werkstoffe und Korrosion, vol. 3, No. 7, p. 286.

The coloring agent S2 Schering Black is described, which rapidly colors iron and steel parts a deep black. It can be easily applied without any previous special knowledge and works without special equipment as a heated coloring solution without current. The colors formed are adherent and resistant to deformation by chemical conversion of the metal surface. As thin colored coatings are obtained, for all practical purposes no dimensional changes occur. Steel tanks are used for dissolving and heating the coloring solution; enameled, tinned, galvanized or aluminum tanks are attacked by the solution and destroyed. A specially designed tank, which can be heated by gas or electricity, is best suited for the purpose.

To prepare 1 liter of the coloring solution ready for use there is required 0.8 kg. of the S2 compound in the commercial powder form and 0.7 liters of water. Before coloring, the iron and steel parts are cleaned of rust, scale, grinding paste and grease. The coloring effect proceeds more uniformly if the degreased parts are dipped, for a short period before coloring, in dilute hydrochloric acid (1 part HCl and 1-2 parts water) and then rinsed. As the coloring bath attacks the skin it is advisable to use plastic gloves and aprons for the workers coming in contact with the bath. A cover should also be provided when the bath is being made up, as any sudden spraying out of the diluting water is then prevented.

The coloring bath is heated for use to about 135° to 140°C. The concentration of the bath is so arranged that it gently boils within this temperature range. The parts to be treated are then immersed in the coloring solution. If the parts are of large size, they are hung by iron wires or racked in the bath solution. Mass production and small sized parts can be placed in steel baskets which are shaken during the coloring process. Soft steel sheet and SM steel are completely blackened in 5-15 minutes. On the other hand, alloy steels require longer coloring times. Stainless steels and similar materials cannot be colored black with the S2 compound. After the desired black shade has been obtained, the parts are taken from the bath and given a

thorough rinse in running water so that no residual solution remains. After rinsing, the parts are carefully dried. In order to increase the durability of the black oxide coating, after careful drying, the colored parts can be oiled. If a lacquer coating is to be applied after blackening, then the oiling is dispensed with.

Notes on Melting of Cadmium Scrap for Anodes

L. Apelt. *Metalloberflaeche*, vol. 6, No. 7, pp. B107-B108.

In the melting down of scrap cadmium residues for castings into anodes, certain precautions are necessary and it is necessary to have an adequate knowledge of the essential facts to conduct this operation in a trouble-free manner. Cadmium has a melting point of 320.9°C. at 760 mm. mercury and commences to vaporize at 450-500°C. Cadmium has a measurable vapor pressure at 400°. On contact with the air, the cadmium vapor is converted into cadmium oxide which issues as a brownish fog from the crucible. If suitable precautions are not taken this vapor can be highly dangerous; it irritates and attacks the mucous membranes, causes headaches and, in severe cases of exposure, can lead to paralyzing of the central nervous system and to death. In addition, apart from the danger to persons in the vicinity, this cadmium oxide vapor represents an appreciable loss of metal, as it is not again reduced under the conditions of the usual melting furnace. The cadmium oxide which does not manage to escape from the melting crucible mixes with the metal and contaminates this. The cadmium oxide with a specific gravity of 8.2 is so close to that of cadmium metal which is 8.7, that it does not float as a crust on the surface of the molten metal but sinks down and cannot then be separated. If the amount of cadmium oxide formed under unsuitable melting conditions is of considerable amount, a pasty mass is formed in the crucible, which is quite unsuitable for any useful purpose.

Further trouble can arise from the fact that the cadmium metal residues from used anodes will not be smooth but will have a roughened, attacked surface and, in addition, the surface will be covered with residues and impurities arising from the plating bath, such as cyanide salts, brightening addition agents, etc. This will lead to further metal loss during the melting down of the scrap. To avoid the above trouble during melting, salt mixtures are used and, with a careful melting down process, common salt will be found adequate for this purpose. Salt has the property of taking up cadmium to a certain extent without melting and then forms an ash which can be skimmed off. A patented covering composition for this purpose comprises 25% potassium chloride, 20% magnesium chloride, 20% sodium chloride, 33% zinc chloride and 2% ammonium chloride.

Finally it can be said that, if the above precautions are observed, the melting down of cadmium metal from the anode residues of cadmium plating operations can be conducted without danger to the life and health of the melter. This information should be of considerable assistance to those platers who are desirous of making use of their cadmium anode scrap but have been hesitant to do so because of the dangers which are involved.

Simultaneous Pickling and Degreasing with the Electro-Alkaline Bath

T. Skutta; *Beiztechnik*, vol. I, No. 4, pp. 53-54.

The Derostan process is described, by means of which a shortening of the processing time is achieved by combining the two operations of pickling and degreasing, which are normally conducted as separate operations, in one stage. With this process the ware to be degreased, cleaned and de-oxidized is processed in a single stage in an electro-alkaline bath with an alternating current and finally, in the same bath, coated with a very thin skin of electrolytic iron which serves markedly to increase the adhesion when the sheet is subsequently enamelled and reduces the tendency to fresh rust formation when the ware is withdrawn from the tank. If the pickled ware is intended for immediate subsequent galvanizing, a few seconds immersion in a subsequent bath serves to remove this gray coating and a chemically clean surface is obtained which is more or less bright, according to the quality of the steel. This surface is suitable both for galvanizing as for the application of an organic finishing lacquer and for further mechanical forming and shaping during which it should be mentioned that tool wear is noticeably reduced because of the soft surface presented.

This simultaneous degreasing and descaling is effected within a short processing period. Thus processing times are given for the German steel sheet qualities as follows: ST X about 2 minutes; ST VIII and ST V 4—6 minutes; ST III 8-10 minutes; black sheet, hot rolled sheet and gray cast iron 20-30 minutes, according to the thickness of the scale layer. Chromium steel sheet requires 15-25 minutes. Cyclic current reversal is used in the bath with a continuous current reversal in the bath at the anode and cathode and this cyclic current reversal is set and maintained by a patented process. A high percentage alkaline electrolyte is required for use. These measures serve to ensure that the monatomic hydrogen which is generated in the bath during the processing, does not diffuse into the steel and cause hydrogen embrittlement or other quality deterioration of the metal.

The plant is operated by means of an 8 volt d.c. current and corresponds in its arrangement and current requirements to a chromium plating bath. An automatic current regulator is necessary as an adjunct, which controls the current reversal cycle. The ware in racks or other suitable arrangement is located opposite electrodes of normal steel sheet. If the ware being treated is flat or only slightly shaped as is the case with sheet, strip, wire, rod etc. flat opposing electrodes are used, made of sheet waste, the distance between the electrode and the ware amounting to 8 cm. There is only slight consumption of the electrodes in this bath, amounting to about 1 mm. per 500 operating hours, calculated on the sheet thickness.

Deep drawn steel parts and shaped cast iron parts can be descaled and degreased in the bath in 20-25 minutes; it is necessary, however, to use shaped electrodes conforming to the profiled shape of the parts being treated; the treatment of tubes greater than 1 meter in length and of smaller diameter than 2" is generally surrounded with difficulties in normal baths: this process allows of treatment of tubes of any re-

quired length, which are perfectly processed on the outside. For the processing of deep-drawn steel parts of large dimensions, for example bath tubs, the application of correspondingly shaped electrodes is relatively easy and such parts can be handled by this process and made ready for enamelling.

Suitable tanks for the plant are constructed of 3 mm. thick, welded steel sheet. No linings are needed. The tanks are provided with adequate suction and venting of the bath fumes, which, although non-poisonous, are unpleasant. An accessory tank, heated to 95°C., contains hot water for rinsing. Heating of the baths can be conducted with large and long installations by a hot air duct under the tank bottom, or otherwise by steam, hot-water or electric heating. The optimum bath temperature is 70°C., but can vary from 60° to 80°C.

The electrolyte used consists of a high percentage caustic alkali solution with a very small percentage of electrolytically active bodies which influence considerably the solution of the oxides and so appreciably reduce the processing time. As the electrolyte is constantly regenerated during the processing, its usage and replenishment is confined to small amounts. The bath is claimed to offer many advantages as compared with normal separate stage acid pickling and degreasing. The amount and cost of the electric current used is quite small and amounts to 1/50 kwh per minute and per sq. meter of treated surface. The actual overall savings compared with an acid pickling bath will vary from case to case but, speaking generally, it is claimed that the operating costs with the electrolytic alkaline bath are only one half of those with an acid pickling bath. The qualitative advantages are impossible to render in terms of actual costing but are, of course, of profound technical significance.

Statistical Control of Modern Continuous Pickling Bath Lines

W. Fackert; *Stahl und Eisen*, vol. 72, No. 20, pp. 1196-1207.

A detailed presentation and calculation of the most important characteristic pickling data is given, by which it is shown how, by fundamental establishment of an hourly amount of pickled ware, there needs to be calculated the acid consumption per ton of ware pickled ascertained either by experiment or from operational data, of the free acid content in the in- and outflowing pickling solutions and the permissible iron sulfate contents of the out- and inflowing volumes. By means of comparative juxtaposition of the in- and outflowing liquor volumes with their contents of free acid, iron sulfate and water, the measures and procedures for control are obtained. It can further be shown, by incorporation of the statistical data given in the available technical literature, from the work of W. B. Wragge, M. Swindin, and J. Pearson, how, presumably, the necessary iron sulfate removal could not be attainable by cooling to technically good obtainable temperatures. Much rather, use must be made of the possibility of influencing the required separation by increasing the sulfuric acid content. The calculation of the sulfuric acid content necessary for this purpose is shown and for four separate cases are given below, based on iron sulfate heptahydrate and iron sulfate monohydrate, calculated on the amount of water to be removed. In conclusion a comparative presentation of processing costs is given by which it is shown that the case 3 given is presumably the most economical, in which the iron sulfate monohydrate is worked up and the sulfate solution only results after the water removal with subsequent sulfuric acid addition.

The four cases considered after the preliminary very detailed statistical survey of the operation and control of modern continuous pickling lines are as follows.

For the separation of iron sulfate heptahydrate:

	Case 1	*Case 2*
a)	Water removal	Water removal
b)	Acid addition	Salt separation
c)	Salt separation	Acid addition

For the separation of iron sulfate monohydrate:

	Case 3	*Case 4*
a)	Water removal	Water removal
b)	Acid addition	Salt separation
c)	Salt separation	Acid addition

The above four cases differ from each other in the amount of the water to be withdrawn after the period of the acid addition and as to whether iron sulfate with 7 or 1 parts of water of crystallization is to be separated out. The technical problem imposed is to withdraw so much water that, at the end of the separation in all cases, the acid content of the solution amounts to 31.8%. With this enrichment to 31.8%, which figure is developed from statistical calculations, there is still present 5% of iron sulfate in the processed solutions. The total amount of iron sulfate thus need not be completely removed, because the residual amount of 5% is very necessary for the correct functioning of the pickling process.

The calculations are based on a given example of descaling in a continuous pickling bath of 25 tons per hour of hot rolled strip with an acid consumption of 15 kg./ton, with an entering acid content of 25% and a spent acid content of 15% sulfuric acid. During each hour 4267 kg. of pickling solution must be removed from the pickling bath which, after removal of the excess iron sulfate and after the make-up of the used sulfuric acid, must give again the inflowing volume of 4060 kg. The four cases cover the removal of the iron sulfate. For the required iron sulfate separation, the removal is necessary of:

386 kg (case 1) or 1190 kg (case 2) water/hour with the separation of the heptahydrate and 799 kg (case 3) or 1603 kg (case 4) with the removal of the monohydrate.

For comparative costing purposes which, of course, decides the ultimate choice of one of the four cases considered, there needs to be considered:

1. The cost of the water evaporation which is necessary to cause the iron sulfate separation.
2. The costs for cooling to the separation temperature and
3. The costs which arise when the bath must again be heated up from separating to the working temperature.

Shop Problems

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Treatment for Magnesium

Question: Would you kindly let me know where the Dow Chemical Co. is located, also whether Dow No. 12 is a Bonderizing process? Can you also give me the formulas and processes for Iridite and Bonderizing?

A. J. C.

Answer: The Dow Chemical Co. is located in Midland, Mich. Dow treatment No. 12 is not a phosphating process similar to Bonderizing but an anodizing process which produces a hard, corrosion resisting coating on magnesium which provides a good paint base and can be dyed or sealed. You will find details on this process on pages 443-4 of the 1951 edition of the Metal Finishing Guidebook-Directory.

We cannot provide you with formulas for Bonderizing and Iridite treatments. Both are patented processes and the materials are sold in compounded form by Parker Rust Proof Co., Detroit, Mich. and Allied Research Products, 4004 E. Monument St., Baltimore 5, Md., respectively.

Yet Again! Spotting Out

Question: The accompanying frame has a white spot on the upper face. The frame is brass, silver-plated and lacquered. This condition seems to crop up during hot, humid weather conditions.

We would appreciate your comments and any suggestions you care to forward to us. We find your magazine very helpful, and your articles very timely.

N. E. H.

Answer: The trouble seems to be the common one of spotting-out. To minimize this condition it is suggested that, before lacquering, the frames should be baked for about 15-20 minutes in an oven at about 210 deg. F. Then allow to cool and lacquer immediately. At the oven temperature there will be no darkening of the silver.

Rusting of Plated Horse-Shoes

Question: We have been gold plating some used horse-shoes for various riding stables, ranches, etc. We find, however, that after a short while these shoes rust through the goldplate.

Our procedure is: remove all traces of rust in muriatic acid, 50-50 acid-water. Thoroughly rinse, cut down with Lea compound and polish with White Nickel Acme polish. We then clean in trisodium phosphate plus a small amount of caustic, with reverse current for a matter of 15 seconds, rinse, cold water, dip in 10% muriatic solution, rinse cold water, dip in cyanide solution (10 oz./gal.), rinse cold water, then flash with copper, plate 30 minutes with nickel and polish. After nickel plating we then flash about ten seconds in gold solution.

I see no reason why these rust spots should come through, but they do, and I am asking whether you may help me. What can I do to eliminate these rust spots?

R. L. S.

Answer: Assuming that you are using a room temperature nickel solution, your half-hour plate will probably give you a nickel deposit of about 0.0002″ maximum. This will not offer much protection on horse shoes, which are not only pitted from rusting but are full of oxide inclusions as a result of the shaping of the shoes in the forge.

We would suggest that you apply a heavy copper deposit, as much as 0.002″ if possible, followed by buffing. This will tend to cover the pits and pores in the base metal. Follow by nickel plating and gold flashing as usual.

Silver and Rhodium on Small Parts

Question: We are endeavoring to obtain information in regards to rhodium plating a very small cylindrical pellet, the specifications and sizes for which are as follows:

Size—Diameter 5/32″, Length 1/8″
Material—Brass
Specifications—Silver Plate 0.0001″ to 0.0002″ deposit. Rhodium Plate 0.000005″ to 0.00001″ deposit. The entire surface of the part must be plated.

We would appreciate your recommendations and comments as to whether these parts should be basket or barrel plated.

S. G. P.

Answer: We would suggest the use of a very small plating barrel of the portable type for your small pellets. The cylinder can then be transferred from the silver strike to the silver plating solution and then, after rinsing, to the rhodium bath.

A barrel of this type may be obtained from Daniels Plating Barrel & Supply Co., 129 Oliver Street, Newark 2, N. J.

Basket plating would be wasteful of silver and rhodium and we believe you will be unable to deposit the thickness required in this manner with any degree of uniformity.

Phenolsulfonic Brightener Control

Question: We have at the moment a problem in our plant regarding addition agents in copper solutions. The question is the following:

In England phenol sulphonic acid is used as an addition agent for obtaining hard deposits of copper in the manufacture of matrices for the gramaphone record industry. Can you tell us if it is much better to use molasses or the former, and what is the control method? Is it necessary to control the temperature, agitation, etc. for the addition of these agents?

A. G. O.

Answer: We would prefer to use phenolsulfonic acid as the addition

agent rather than molasses but, in either case it is necessary to control all operating conditions closely in order to stay within the "bright plating range," which is true to some extent of all plating solutions containing brighteners.

Phenolsulfonic acid can be determined as follows (R.O. Hull & W. Blum, National Bureau of Standards, Research Paper #228 [1930]).

Dilute a 10 ml. sample of plating solution to 50 ml. and add 2 g. of 20 mesh zinc to precipitate the copper. Filter into a 200 ml. flask and then pipette in exactly 10 ml. of 0.1 Normal "Bromine" solution (2.8 g./l. potassium bromate and 12 g./l. potassium bromide). The Bromine is standardized against 0.1 normal sodium thiosulfate as a blank.

Add 50 ml. hydrochloric acid and close with a rubber stopper. Heat on a water bath at 50 deg. C. for ½ hour. Cool, add 2 ml. of 10% potassium iodide and titrate the liberated iodine with the standard thiosulfate solution using starch indicator as usual. Each ml. of 0.1 N. bromine solution is equivalent to 0.00157 g. phenol.

The proper amount of phenol should be 0.13 oz./gal. as phenolsulfonic acid.

Cadmium Staining

Question: In the accompanying package are several cadmium plated parts which you will note are quite badly stained. The small bent sheet metal samples are of brass while the larger cast items are of Alnico V. These have been in our stockrooms, stored in open tote boxes for several months. Many of these items are used on aircraft applications and therefore must be cleaned or replated before they can be assembled.

We would like to know what may be wrong with our plating procedure or if some additional after-plating treatment will be necessary to keep this finish bright.

H. R. T.

Answer: The most common causes of cadmium staining are three:

1. Improper rinsing.
2. Insufficient drying.
3. Improper packing and storage.

An additional factor in the case of the cast parts is the porosity, which results in trapping of solution, also we note a certain amount of fingerprinting.

If the parts are dried thoroughly and stored in a dry place, the effects of poor rinsing will be negated. This is the angle we would suggest you work on. If necessary, the parts should be baked at about 250°F. for about ½ hour. Bright dipping after plating will help, especially the chromate type of dip.

Chromium Plating Hardened Steel

Question: We have to solve a problem which seems to be rather difficult. We tried many solutions and the results we obtained were poor or bad. The question is to hard chromium plate steel pieces which are hardened before plating. The heat treatment involves the use of sodium cyanide which leaves on the surface some dark spots we could not remove.

We tried, without success, pickling in various baths (sulfuric, hydrochloric, hydrofluoric, nitric, oxalic, citric, sodium hydroxide, sodium cyanide) but the only result we get is to darken the surface without removing the dark spots.

Concerning the chromium plating itself, we have no difficulty, but the original spots reappear after plating.

M. L.

Answer: The sample forwarded has deep pits and rolling lines which appear to be full of scale inclusions. It would be very difficult to remove the scale after hardening and, since the scale is non-conducting no chromium will cover these spots.

Our suggestion would be to use a better grade of strip or to grind the surface down to the base of the pits and inclusions. Pickling before hardening may be successful and is worth trying.

Patents

Recently Granted Patents in the Metal Finishing Field

Zirconium Oxide Polishing Material

U. S. Patent 2,624,661. *Jan. 6, 1953. J. B. Miller, assignor to National Lead Company.*

The process of deriving a finely divided zirconium oxide polishing agent from crude zirconium oxide containing as an impurity inflammable zirconium compound which consists in calcining said product under oxidizing conditions at a temperature of approximately 1,300°C. until the product is rendered non-inflammable, thereafter dry milling said product to a particle size of less than about 44 microns and thereafter continuing size reduction by wet milling to less than 5 microns.

Electroplating Barrel

U. S. Patent 2,624,728. *Jan. 6, 1953. G. Dubpernell, and S. M. Martin, assignors to United Chromium, Inc.*

In an electroplating barrel for barrel plating articles with chromium or with other metals difficult to electroplate comprising a tank for holding a plating bath, a rotatable open-ended article-supporting metallic cylinder supported on the tank for partial immersion in the bath, a horizontal conducting shaft electrically and structurally connected at one end of the cylinder by means of which the cylinder is rotated, means for electrically connecting the shaft to the cylinder, an anode supported in the cylinder, means for rotating said cylinder shaft and the cylinder connected thereto, and means for connecting said cylinder and the anode in an electric circuit through the plating bath, the improvement in which said cylinder is imperforate, said cylinder having a conducting inner cylindrical surface and having electrical insulation covering the outer cylindrical surface thereof to avoid diversion of current between the anode and articles supported in said cylinder, said electrical connecting means between the cylinder and its supporting shaft comprising a split tapered threaded hub attached to the cylinder for receiving the shaft, and a nut for said threaded hub acting to force the split end of the hub into binding engagement and firm electrical contact with the shaft, said hub and nut also permitting the cylinder to be detached from the shaft, said means for rotating the cylinder and cylinder shaft comprising a conducting pulley on the cylinder shaft and a non-conducting driven belt for driving said pulley, and said means for connecting the cylinder and anode in an electrical circuit including contact brushes in contact with said conducting pulley.

Buffing Machine

U. S. Patent 2,624,158. *Jan. 6, 1953. F. E. Hendrickson, assignor to Bror G. Olving.*

In combination in a polishing machine, a plurality of pulleys for a polishing belt comprising two aligning wheels and a work wheel therebetween, said work wheel comprising a hub and a plurality of separate segmental outward-extending sections of flexible material supported thereon, the whole wheel being so flexible that it develops a substantial part of its belt-supporting stability by centrifugal force, a movable support for said work wheel permitting movement thereof transverse the tangent between said aligning wheels sufficient to move said work wheel from a position in which it barely touches a belt on said aligning wheels to a position in which from 30 to 90 angular degrees of the periphery of an uncompressed work wheel engages said belt, another of said plurality of pulleys having a movable support movable for tightening a belt, and means for locking the movable supports of said work wheel and belt-tightening pulley.

Liquid Blasting Machine

U. S. Patent 2,624,988. *Jan. 13, 1953. H. J. Vander Wal, assignor to Wagner Bros., Inc.*

The method of polishing or buffing comprising the steps of blast impinging the work with a liquid vehicle carrying small fragments of sponge rubber and small fragments of felt, and a powdered abradant.

Liquid Blasting Machine

U. S. Patent 2,624,982. *Jan. 13, 1953. H. J. Vander Wal, assignor to Wagner Bros., Inc.*

In combination with a work advancing means having a series of article holders mounted therealong, walls forming an enclosure about one reach of said means, a sump tank associated with said enclosure, a plurality of nozzle elements adjustably supported from the walls of said enclosure and disposed longitudinally over said one reach, means for adjusting the angular position of said nozzles relative to said one reach, tubes for supplying liquid to said nozzles, a pump and manifold for recirculating said liquid from said tank to said tubes at a pressure in excess of 200 lbs. per square inch, and a charge of liquid in said tank including an abrasive and small pieces of felt and sponge rubber.

Aluminum Bright Dip

U. S. Patent 2,625,468. *Jan. 13, 1953. S. R. Prance and H. J. Reindl, assignors to General Motors Corp.*

In the method for brightening aluminum and aluminum alloy parts in a chemical bath and simultaneously maintaining the effectiveness of the bath wherein the bath consists essentially of an aqueous solution of nitric acid together with the ions of ammonium and fluoride, a metal and chromic acid and a carbohydrate, the steps comprising; dipping aluminum and/or aluminum alloy parts into said bath for brightening the surface of said parts, removing between .004 and .01 of a gallon per gallon of said brightening bath for each square foot of aluminum and/or aluminum alloy treated therein, and adding new solution of the same composition as the initial bath in equal quantity to the removal, whereby the brightening action of the bath is maintained substantially constant.

High-Temperature Cleaning

U. S. Patent 2,625,495. *Jan. 13, 1953. C. Cone and J. Huebler, assignors to Surface Combustion Corp.*

A method of cleaning ferrous metal whose surface carries carbonaceous matter and iron oxides that comprises the step of exposing said metal at a temperature of 670°F.-1700°F. to an atmosphere that contains both (1) a gas that is oxidizing to carbon and (2) a second gas that is deoxidizing to iron oxides, and so adjusting the length of time of such exposure and the concentrations of gas (1) and of gas (2) in the atmosphere during such exposure that substantially complete removal of both the carbonaceous matter and the iron oxides is accomplished simultaneously.

Corrosion Prevention

U. S. Patent 2,625,511. *Jan. 13, 1953. A. G. Rocchini, assignor to Gulf Research & Development Co.*

An improved hydrocarbon oil composition comprising a major amount of a hydrocarbon oil and a minor amount of a nitrogen-containing compound selected from the group consisting of the amides and imides of substituted succinic acids having a substituent in the aliphatic chain, selected from the group consisting of the alkylthio and arylthio radicals, and an organic amine having only one amino group containing an N-hydrogen atom, the amount of said nitrogen-containing compound being sufficient to impart corrosion-inhibiting properties to said composition.

Rotary Abrasive Head

U. S. Patent 2,625,774. *Jan. 20, 1953. A. R. Tenny, assignor to Van Arsdale Corp.*

A rotary abrasive head adapted to be mounted upon a rotatable spindle and comprising a pair of axially spaced end plates rotatably fitted on said spindle, a hub member disposed between said end plates and also rotatably fitted on said spindle, means for nonrotatable locking said plates and hub member together on said spindle for rotation as a unit therewith, a plurality of abrasive-coated strips embraced between said plates with their inner ends respectively anchored to said hub member and their outer ends projecting externally of the head at points spaced circumferentially about its periphery, and wedge means interposed between said hub member and said spindle operative, when said spindle is held stationary and said plates are loosened for rotation relatively thereto, to lock said hub member to said stationary spindle and thereby permit angular displacement of the plates relatively to the hub member to vary the extent of projection of the strips outwardly of the head.

Stripping Lead Alloys

U. S. Patent 2,626,879. *Jan. 27, 1953. A. Lazar.*

A method of removing deposits containing lead compounds from metal parts, said method comprising contacting the deposit-carrying metal parts with an aqueous solution of ammonium acetate.

Anode Package

U. S. Patent 2,626,046. *Jan. 20, 1953. R. H. Long, assignor to The Harshaw Chemical Co.*

A package comprising a plurality of parallel anode bars of generally elliptical cross-section arranged on edge in a pack one anode thick, each anode bar having a side in contact with the side of an adjacent bar, and a plurality of rigid skids secured to said anode bars on the same side thereof in contact with the edges thereof and extending at approximately right angles thereto, each of said skids having a pair of spaced openings extending therethrough, said skids being secured to said anode bars in the relative position aforesaid by means of ties each passing around said bars transversely thereof through said openings and around a portion of a skid longitudinally thereof, each said tie having a top portion extending across the package adjacent to the edges of said bars remote from said skids and said portion being of a length approximately equal to the sum of the maximum thicknesses of said bars less the difference between the minimum and maximum thicknesses of one of said bars, side portions continuous with said top portion at each end thereof and passing downwardly adjacent a curved surface of an anode bar and a bottom portion connecting said side portions and being of a length approximating the sum of the maximum thicknesses of said anode bars, and said skids being longer than the sum of the maximum thicknesses of said bars.

Tarnish Remover

U. S. Patent 2,628,199. *Feb. 10, 1953. F. A. Lowenheim.*

A cleaning composition for silver- and copper-containing metal surfaces consisting essentially of 1 part by weight of an acid having a pK in the range of 1 to 5 and about 3 to 5 parts by weight of thiourea, said acid being water-soluble, stable, non-oxidizing, and forming no water-insoluble compounds with copper or silver.

Buffing Wheel

U. S. Patent 2,627,146. *Feb. 3, 1953. G. A. Lyon.*

In a wheel structure, a core, a continuous cable wound under tension on said core, surface treating material projecting radially from said cable and wound with said cable tightly on said core, said core having a recess therein adjacent one end thereof, a block disposed in said recess, means for securing one end portion of said cable to said block, said block extending under at least the first convolution of said cable and being locked in said recess by said cable, and means for securing the other end of said cable to said core.

Surface Tension Measuring Device

U. S. Patent 2,627,177. *Feb. 3, 1953. B. Vonnegut, assignor to General Electric Co.*

An instrument for measuring the surface tension of a liquid, comprising a plurality of arms joined together to form a substantially open planar frame, an indicating scale carried by said frame, an elongated substantially planar rigid loop having an open center, said loop being fixed to one of said frame arms and extending longitudinally in a plane normal to the plane of said frame, and a highly flexible resilient filament fixed at one end to said frame, extending in the plane of said frame through said loop and with its free end movable opposite said indicating scale, whereby, when said frame and loop are dipped in a liquid and withdrawn, a first film of liquid is formed in said loop, a second film of liquid is formed in the space bounded by said filament, said frame and said first film, the surface tension in said film deflects said filament, and said filament indicates the deflection on said scale.

Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

Immersion Heater for Alkaline Solutions

Cleveland Process Co., Dept. MF, 7016 Euclid Ave., Cleveland, O.

A new type of heavy duty steel sheathed immersion heater for alkaline bath heating has been announced by the above manufacturer.

According to the manufacturer, the Clepco-Glorod Series W immersion heater is conservatively designed for safe operating temperature of the nickel alloy resistance element which is covered by a quartz body, claimed to be the most uniform and efficient protective conductor of heat. This permits longer service life. Low heat density protects both heater and liquids from damage due to carbonization or "frying."

A sealed, vapor-proof Underwriter's Approved junction box prevents entrance of liquids and vapors. Units are portable, a single unit can serve many tanks and be quickly mounted over the side of the tank, or, as in the case of vapor degreasers, screwed into 2 inch threaded holes in the bottom of tanks.

This new heater has proved successful in high alkaline solutions and copper cyanide plating baths. It can also be used in vapor degreasers and for heating alkaline plating baths such as brass, bronze, cadmium, gold and silver. It is also available with a brass sheath for maintaining constant temperature water supply.

The heaters are available as dual voltage (230V and 460V), single phase in capacities of 1,000, 2,000, 3,000, 4,000, 6,000 and 10,000-watts —overall lengths ranging from 14" to 70". Brass or stainless steel protective sheaths can be furnished. Units are priced from $27.00 to $82.40.

New Line of Rectifiers

General Electric Co., Dept. MF, Schenectady 5, N. Y.

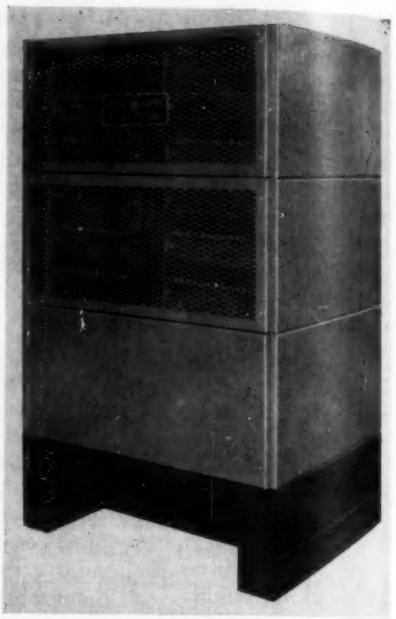
A complete new line of metallic rectifier power supplies for electroplating and anodizing operations has been announced by the company's Lighting & Rectifier Department.

Incorporating a number of advances in operating convenience and efficiency, the new equipment is substantially lower in price than former units because of the extensive use of interchangeable standardized components.

The line includes manually controlled and automatically regulated power supplies, as well as special equipment for barrel plating and precision laboratory work. Maximum operating economy in each rating is achieved by using a variety of circuits and either copper-oxide or selenium rectifier stacks, depending on the output desired.

D-c ratings for the new manually and automatically regulated systems range from 500 amperes at 6 volts to 2,000 amperes at 48 volts. Units for barrel plating are available in ratings from 500 amperes at 6 volts to 2,000 amperes at 12 volts. Laboratory platers are rated 50 amperes at 9 volts and 65 amperes at 18 volts.

Saturable reactor control is employed on manually and automatically regulated power systems. A single operator's control station, for mounting beside the plating tank or adjacent to the rectifier units, controls the entire d-c output of the system regardless of the number of individual units employed. Manually controlled systems of the new line may be converted at any time to automatic regulation. This is accomplished by adding an additional section to one of the existing units to regulate voltage or current, or for anodizing control.



In lower ratings, controls and rectifiers are housed in the same wall-mounted cabinet. Larger ratings are floor-mounted, and employ unit construction for ease of shipment and installation. No special foundations are required.

Where especially corrosive atmospheres will be encountered, power supplies using oil-immersed selenium stacks are available.

Protective Finish for Magnesium

Allied Research Products, Inc., Dept. MF, 4004 E. Monument St., Baltimore 5, Md.

The above company has announced the addition of Iridite No. 15 (Mag-Coat), a new protective finish for magnesium, to its line of protective

finishes for zinc, cadmium, aluminum and cuprous alloys.

Like all these finishes, the new product for magnesium is a chromate conversion coating. Dark brown in color, the finish is best described as of a complex chromium-chromate nature. This film is highly resistant to atmospheric corrosion, as well as to corrosion from some chemical sources. The film is an integral part of the metal itself, rather than a superimposed film. Thus, it will not chip, flake or peel when bent. A slight dimensional change is caused by the treatment, the degree depending upon time of immersion.

The film is produced by simply immersing the parts in the solution at ordinary room temperatures and without the use of electric current. No special equipment is required.

A slight amount of fuming will be noticed when magnesium parts are immersed. This is a product of the reaction that produces the surface finish and the hydrogen gases generated may be easily vented off with usual ventilating equipment, if found objectionable.

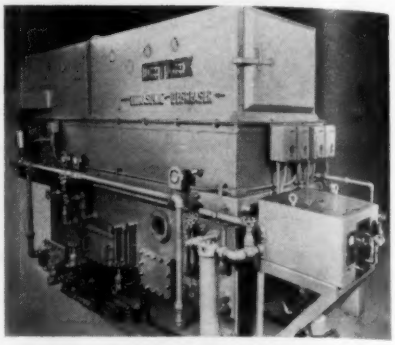
Speed of processing is perhaps the chief advantage of the new treatment for magnesium. Immersion times vary from as few as 15 seconds to only 2 minutes, depending upon the condition of the metal prior to treatment, alloy treated, and dimensional stability required.

Iridite No. 15 is shipped in powder form in disposable steel pails. Shipping quantities are 10 lbs., 50 lbs., and 100 lbs. One pound of powder will make up slightly more than three gallons of working solution.

The process can be applied to wrought, cast or extruded magnesium. It may be used either as a final finish or a base for paint. It will meet present standards for protective treatments of magnesium parts.

Ultrasonic Degreasing

Detrex Corp., Dept. MF, Detroit 32, Mich.



Detrex has recently announced the development of an advanced, practical method of metal cleaning through the use of ultrasonic waves.

The new method, known as the Soniclean process, features a man-made element for directing sound energy—a development which Detrex technicians say opens the door to far-reaching advances in a wide variety of industrial fields.

By employing a new transducer element in place of the quartz crystals previously used in ultrasonic experiments, the company claims to have overcome the limitations caused by the size and properties of quartz. The element, jointly engineered by Detrex and the *Brush Electronic Co.*, is a curved piece of ceramic resembling a six-inch-long pipe, cut in half along the longitudinal axis.

In the new process, electrical energy is transmitted to the ceramic transducer, converted into sound energy, and projected through a solvent at a frequency of 430,000 cycles per second. The solvent currently being used in the process is trichlorethylene; however, the process is not limited entirely to this material. Because a potential of only 40 volts is required to operate the ceramic transducers, they can be safely immersed directly in the solvent. This eliminates the complicated sealed containers that are required with other transducer materials and high voltages.

Material to be cleaned is placed in the solvent, either manually or by

conveyor, directly in the path of greatest focal intensity of the ultrasonic waves. In this area an extreme turbulence is created, resulting in a deep and penetrating cleaning action that removes, almost instantaneously, all dirt, grease, chips and microscopic particles of soil from even the most intricately designed and close-fitting parts.

The high frequency Hypersonic generator used in the process is completely protected by numerous safety and overload devices and provides easily adjustable tuning drawers that offer absolute frequency control.

Tumbling Barrel

The Abbott Ball Co., Dept. MF, Railroad Place, Hartford, Conn.

A new, improved barrel finishing unit designed to efficiently handle burnishing, de-burring and cutting-down operations is announced by the company. Other outstanding features listed by the manufacturer include precision speed controls, interchangeable parts, Color Dynamics and low operating costs.

Built around the high, vertical barrel which was first developed and marketed by Abbott, the new unit is compact and efficiently designed. Power is supplied by an electric motor mounted on the barrel pedestal. A standard motor base is provided to

accommodate several sizes and makes of motor. Precision speed control is maintained by an American reduction drive attached directly to the barrel shaft. Linkage between the motor and the reduction unit is provided by "V" belts and sheaves. Speed of the barrel is tailored to fit the user's requirements through a combination of sheaves. The unit is controlled with a conveniently located push-button safety switch which can also be used to "jog" the barrel to any desired position.

According to the manufacturer, the unit's improved design and the use of a highly efficient drive mechanism makes it possible to operate the barrel with a comparatively small motor. The reduction drive unit and "V" belts provide a low torque drive which produces a minimum shock and starting load on the motor. Normal operating speeds are reached almost instantly.

Interchangeability of parts is said to add versatility and economy to the new unit. Since end plates and side walls of all tumbling barrel bodies tend to wear out more rapidly than other parts, replacements are an important consideration to most users. By providing interchangeable parts for the new barrel, Abbott spokesmen claim a substantial savings in operating costs can be realized since it is not necessary to replace the entire barrel but only that part which is worn out.

The new units are made in four standard sizes and are available in ten basic combinations with single, double and triple compartments to fit the user's requirements. Standard barrel I. D. sizes for single barrels equipped with maple linings are 24" x 8", 24" x 16", 30" x 8" and 30" x 16". Barrels used for de-burring or cutting-down operations do not have the 3 inch hard rock maple linings.

New Phosphating Compound

Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.

The manufacturers have announced

the development of Oakite CrysCoat HC, a phosphatizing material which creates a complex zinc phosphate coating on steel and iron to promote excellent adhesion of paint to metal. They report that it provides a coating that is crystalline in nature and has a weight ranging from 200 to 1,200 milligrams per square foot, depending upon how it is applied and the type of steel being treated. It may be used in tanks and in pressure-spray washing machines, and with both methods the following Government Specifications are fully met: JAN-C-490, Grade I; 57-0-2C, Type 2, Class C; and PA-PD. 191 Rev. A. The salt spray resistance of painted parts treated with CrysCoat HC is said to exceed the requirements of these Government Specifications. An outstanding feature of this product, the manufacturers state, is that sludging and scaling are held to the absolute minimum. Another advantage is that an all stainless steel tank set-up is not necessary. The tank may be of stainless steel, if available, but mild steel is satisfactory. A third important feature of this material is its simplicity in use. Only one material is involved. The only upkeep required is the material itself. No special additives or toners are needed, it is claimed. Upkeep is determined by a simple titration procedure, with the equipment for this being supplied by the manufacturers.

Additional information regarding this material, plus data on recommended methods of application, suggested solution concentrations, operating temperatures, etc., is provided in a special service report available from the manufacturers.

Blackening Process for Stainless Steels, Cast & Malleable Iron

The Mitchell-Bradford Chem. Co., Dept. MF, 2446 Main St., Stratford, Conn.

The above firm announces a new Black Magic S. S. process for blackening stainless steels, cast and malleable irons which is a one salt mixture, one bath process operating at a temperature of 255°-260°F.

The process produces a lustrous, adherent black finish on stainless steels, cast and malleable irons which will not chip, flake or peel. Immersion time in the blackening solution is from 5 to 15 minutes.

The finish is very economical and inexpensive to apply. The cost of application for chemicals is less than ¼c

per square foot. The parts to be finished can be processed in baskets and in a few cases should be racked. A large amount of work can be processed in a relatively small volume of blackening solution.

The solution is made up by using 5 to 5½ lbs. of blackening salts for each gallon of solution and in this proportion will give a boiling point of 255°-260°F.

Information and literature is available on request and sample parts will be processed at no charge or obligation.

Neoprene Painting System

Pennsylvania Salt Mfg. Co., Dept. MF, 1000 Widener Bldg., Philadelphia 7, Pa.

The Pennsylvania Salt Manufacturing Co., after three years of testing under the most severe corrosion conditions in its own plants, has introduced a new system of anti-corrosion coating using specially formulated neoprene coatings.

The new system, reported Pennsalt maintenance engineers, has resulted in savings up to 50 per cent per square foot in the maintenance painting and coating costs in the company plants.

The special formulations, added to Pennsalt's regular line of corrosion resistant paints and cements, are NeoCoat and NeoPrime A (for all surfaces except concrete) and NeoPrime B (for concrete surfaces).

NeoCoat is a true plastic, involving polymerization, in which the accelerator is included in the product, thus eliminating the necessity of mixing on the job. The polymerization takes place after the coating is applied.

The special formulation of this coating was developed as the result of Pennsalt's tests and experience in its own plants. In these tests it was found that to stand up in service, a coating had to be built up to a thickness of at least 5 mils, regardless of its corrosion resistance, and had to be especially effective in covering welds, beads, seams and edges where coatings most frequently failed.

It was also found that it is uneconomical, from the labor and time standpoint, to apply more than three coats, including the primer. Therefore, NeoPrime and NeoCoat were formulated to attain the proper thickness within three coats.

Pennsalt engineers also tested a wide variety of possible formulations and found the NeoCoat and NeoPrime

formulations to be the most effective under the widest variety and severest corrosion conditions. In addition to developing the new coatings themselves, it was also necessary to work out practical methods of surface preparation, application and maintenance.

In a number of cases, it was reported, the overall initial cost of using the new system appeared to be higher than other methods, but measured against maintenance painting costs over several years, the new system was about half that of other systems.

Multi-Drum Finishing Barrel

Preakness Inc., Dept. MF, 972 Broad St., Newark 2, N. J.

The manufacturers have released several new designs of multi-drum finishing barrels for deburring and burnishing small parts.

Where parts are small or production runs are limited, it is not practical to put such parts in large tumblers and it is for this type of work that Preakness has designed their finishing barrels. Manufacturers of small screw machine parts and stampings have found these tumblers a welcome addition to their finishing department.

Model 4D pictured has four removable drums. An exclusive feature is elimination of shut down time inasmuch as any drum can be removed for filling and emptying while the remaining drums continue to operate. The drums are available in perforated sides for wet tumbling or solid sides for dry or wet tumbling. Solid sided drums are also available with rubber linings to use for ball burnishing. Model LD4 has four octagon shaped drums having double the capacity of those pictured and is more practical for those that have larger pieces.

Models are compact, taking up little floor space, and come complete with electric motor and starter switch. Positive chain drive and ball bearings provide a durable machine. Because of the multi-drum arrangement, it is possible to finish four different pieces at the same time with different types of

finishes! Ferrous and non-ferrous parts can be tumbled at the same time.

Tanks

Duroplastic Tanks, Dept. MF, 376 Washington St., Malden 48, Mass.

The above concern manufactures laminated, resin-bonded fiberglas hoods ducts and tanks. These containers are claimed to be strong, tough, resilient and non-conductive of electricity.

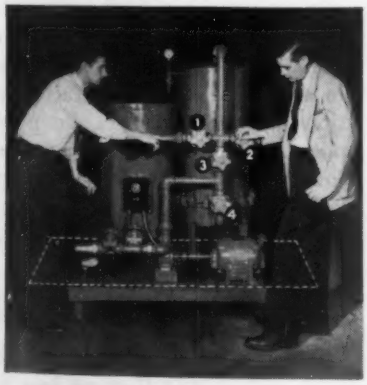
Standard sizes are available for immediately delivery, and price and delivery on custom sizes are furnished on request.

Titeflex Filters Redesigned

Titeflex, Inc., Dept. MF, 500 Frelinghuysen Ave., Newark 5, N. J.

The manufacturer announces that the line of Titeflex filters has been redesigned so as to reduce to a considerable extent the amount of floor space required. As an example, the filter illustrated (Model IA-18-20) is 4′ x 3′, as compared to 5′ 10″ x 2′ 9″ for the model which it replaces—or 12 sq. ft. compared to 16 sq. ft. In larger models the savings in space are even more significant. The reduction in floor space requirements is all-important in installations where the area available for filtration is limited.

Improvements have also been made in the location of control valves and of motor and pump. As shown in the photograph, the control valves have been grouped in front of the filter at



a height which makes them readily accessible to any workman and requires less floor space in operation. Motor and pump are placed in front of the precoat tank and the filter chamber, simplifying any maintenance required, such as packing pump.

Operation of these filters is carried out by turning a few valves, greatly

reducing man hours required to operate filtration equipment. No bags, sheets or pads are needed. Standard models are available with capacity on water from 300 to 10,000 G.P.H., and specially-designed larger filters can be built to customer's requirements.

Descriptive literature is available from the manufacturer upon request.

Manufacturers' Literature

Cleaning & Finishing Methods

Frederick Gumm Chemical Co., Inc., Dept. MF, 538 Forest St., Kearny, N. J.

A new catalog has been prepared, containing factual information on the surface preparation of all base metals for any type of finishing. This catalog shows complete Clepo cleaning cycles for various electroplating applications; also included are sections on deburring and burnishing methods, and the treatment of aluminum with Clepo aluminum compounds. There is also a supplement on plating solution analytical procedures.

G.E. Bulletin on Rectifiers

General Electric Co., Dept. MF, Schenectady 5, N. Y.

A new eight-page bulletin on the complete line of General Electric metallic rectifier power conversion units has been announced as available from the company.

Designated as GEA-5658B, the publication lists the design features, advantages, description, performance, circuits, dimensions, and ratings for the complete line, rated from 125 to 250 volts d-c. A guide is also provided as an aid in preparing contract specifications which entail G.-E. d-c. power supplies and exciters. Drawings show the outline dimensions of the power-conversion units.

Replacing Mineral Acids in Scale Removal

Magnus Chemical Co., Inc., Dept. MF, South Ave., Garwood, N. J.

The company has just released reports on the use of their D-Scale-R line of inhibited acid cleaners in a number of plants to replace muriatic acid in the removal of heat treating and annealing scale, rust and carbonized drawing soaps from various steel parts. The D-Scale-R line is based on the use of a solid material which does not become active from an acid stand-

point until dissolved. Not only is it easier and safer to ship, handle and store, but since it is inhibited against action on metals, it is much safer in use than mineral acids.

From an over-all cost viewpoint, the Magnus method is about the same as the previous one, in spite of the low cost of the raw mineral acid. However, results are materially improved and the hazard of handling the raw acid as well as the generation of acid fumes is ended.

Tin Flowing Data Sheet

Metal & Thermit Corp., Dept. MF, 100 East 42nd St., New York 17, N. Y.

The flowing (Brightening) of electrodeposited tin is the subject of a new data sheet number 120. The entire process, equipment and solutions are described. Common difficulties and their correction are also discussed. Copies may be obtained by writing the above company.

V-Belt Catalog

Raybestos-Manhattan, Inc., Manhattan Rubber Division, Dept. MF, Passaic, N. J.

A new fractional horsepower V-belt catalog for use in servicing light duty applications has been announced by the above firm. In this catalog belts are listed according to the new industry-standard numbering system. Various type machines are listed together alphabetically by company or trade names for convenience in determining the proper belt.

Water Wash Compound for Spray Booths

Klem Chemicals, Inc., Dept. MF, 14401 Lanson Ave., Dearborn, Mich.

The above manufacturer announces a line of water wash compounds which make the reclaiming of paint from spray booths more practical and economical.

Featured in this line is the new water wash compound No. 203 compounded to eliminate nightly draining of tanks. Tests show that No. 203 may be used up to 7 days before draining is required. Circulation lines, water pumps, flow control nozzles and baffles were reported free of paint sludge at the end of this period in production tests.

The principle of No. 203 is to lower the surface tension of the water, assuring complete and more uniform coverage on the water curtain and to keep

the paint in a form that may be easily reclaimed. Trained Klem engineers in the field are available to inspect spray operations and make recommendation, or if preferred, department heads interested may write the company for detailed information.

Synthetic Hard Rubber Pipe and Fittings

The American Hard Rubber Co., Dept. MF, 93 Worth St., New York, N. Y.

The company's new heat and chemical resistant synthetic hard rubber compound, Tempron, is described fully in the new 4-page bulletin 96-A. Ideal for pipe and fittings, this material has greater rigidity, heat resistance and chemical resistance than other soft or hard nitrile-base compounds hitherto available. In chemical resistance at elevated temperatures it excels other rubber and plastic materials. At room temperature it resists many organic chemicals which attack natural rubber, soft rubber and plastics. It is also available as sheet, rod and tubing and molded parts.

This bulletin gives complete information on pipe and fitting sizes as well as data covering the physical and electrical properties of the material. It lists many chemical solutions that Tempron can handle.

Rotary Pumps

Leiman Bros., Inc., Dept. MF, 100 Christie St., Newark 5, N. J.

Catalog No. 752, on rotary positive air and vacuum pumps, has been released. The catalog details construction and operational features of Leiman's four-wing and two-wing pumps, designed for applications requiring up to 29.9 in. vacuum and 25 p.s.i. Tables of vacuum, pressure and specifications are given for each type of pump. Also covered are Leiman air motors and accessories.

Finishing Systems

Cincinnati Cleaning & Finishing Machinery Co., Dept. MF, Schmidt Bldg., Cincinnati, O.

A new, 16-page catalog on "Complete Finishing Systems" has just been published. The new literature illustrates and describes a wide variety of finishing systems and equipment.

Both integral (self-contained) systems and unitized types are covered. The examples shown cover small and

large parts, auto hardware, ordnance and similar finish applications.

Processes outlined include: pretreatment—acid, alkali or solvent cleaning; paint application—by spray, dip or flow; drying—using gas, steam, oil or electric heat and make-up air—replacing plant air exhausted by the three previous operations.

Considerable data is given outside of the installation examples which are handled in "case history" manner in substantial detail. A copy will be sent those requesting it on a firm letterhead addressed to the above company.

Wet and Dry Tumbling

Tumb-L-Matic, Inc., Dept. MF, 4510 Bullard Ave., New York 70, N. Y.

A new bulletin, PC-52, offered by the above company describes five Tumb-L-Matic processes for finishing metal and plastic parts by tumbling the parts with abrasive materials in rotating barrels.

Wet and dry processes for metal parts, wet and dry processes for plastic parts, and a combination process for special problems and materials are described. The bulletin tells when and where to use the different processes and the results you will get with each one.

Included in the bulletin is a table listing the various types of barrels, and abrasive compounds and carrier media used for the cutting, smoothing and lustering steps of these processes. Also noted are research services offered by the Research Development and Technical Service Division of the company.

You can get this bulletin by writing to the above company.

Hardness Conversion Tables for Steels

International Nickel Co., Inc., Dept. MF, 67 Wall St., New York 5, N. Y.

A celluloid card of wallet size gives approximate relationship between Brinell, DPH (Vickers), Rockwell and Shore Scleroscope hardness values and corresponding tensile strengths of steels. Data from SAE Handbook.

Control Instruments

Minneapolis - Honeywell Regulator Co., Brown Instruments Division, Dept. MF, Wayne and Windrim Ave., Philadelphia 44, Pa.

Catalog 1053 describes Brown millivoltmeter type instruments: indicators, indicating electronic controllers and

excess temperature safety cut-off controllers. Information on operation and applications of on-off. two-position, three position and "pulse type" time-proportioning controllers is included as well as data on primary measuring elements, dimensions, ordering information and scale selection tables.

Self-Cleaning Dust Collector

Pangborn Corp., Dept. MF, Hagerstown, Md.

The above manufacturer has announced the availability of a new bulletin No. 915 which describes the Type "CH-3" Self-Cleaning cloth screen dust collector.

This two-color six-page brochure illustrates the engineering features of the new dust collector unit which uses the principle of reverse air flow for continuous cleaning of the cloth filters.

The bulletin also points out some of the engineering features of the equipment which reduce operating and maintenance costs. These include: all steel wire mesh screen frames, electrically grounded, which prevent cloth collapse under air load; screens of convenient size and weight, easily handled by one man; cloth filter bag of simple design applied to frame without tension or strain; all moving parts located on clean side, out of dust, thus eliminating wear; and accessibility on both dust and clean sides for inspection, thus assuring low maintenance and long life.

Copies of bulletin No. 915 may be obtained directly from Pangborn Corporation, Hagerstown, Md.

Practical Nickel Plating

International Nickel Co., Inc., Dept. MF, 67 Wall St., New York 5, N. Y.

Bulletin No. 77, a 44-page general publication with over 40 illustrations, tables and charts, provides the designer, specifying engineer and user with basic information on electroplating and detailed information on nickel plating and its practices. Keyed bibliography suggests 41 sources of additional reading for those who want greater detail or have special interests. Information on the mechanical properties of deposits, plating conditions and commonly used solutions will be found. Recommendations are made on preparation of basis metals, recognition and correction of plating difficulties and purification of solutions. Thickness and type of nickel deposit for adequate service life in many corrosion resistant, industrial and electroforming applications are discussed.

Technical Data and Tips on Heating

Jensen Specialties, Inc., Dept. MF, 9331 Freeland Ave., Detroit 28, Mich.

A brand new bi-monthly publication of technical data and tips on process heating is now being published by the above industrial oven manufacturer.

Typical installations at major U. S. manufacturing plants are featured in each issue. Special heating problems of these manufacturers—and how they were solved—are described and illustrated. Other factual reports and features—with pictures—round out the four-page publication.

Corrosion-Proof Structural Plastic

Atlas Mineral Products Co., Dept. MF, 61 Ash St., Mertztown, Pa.

Complete engineering facts, including information on fabrication and design factors, physical strength and chemical resistance of unplasticized, rigid polyvinyl chloride Ampcoflex are provided in new Bulletin 9-1.

Resistance characteristics of the material are charted to clearly indicate its applicability to specific industry corrosion problems, as well as its resistance to specific reagents at both low and high temperatures. A detailed tabulation of physical properties emphasizes the structural fitness of this

lightweight, self-supporting material for various forms of corrosion-proof construction.

Techniques of unplasticized, polyvinyl chloride fabrication are also discussed in the bulletin with illustrations of fume exhaust systems, tanks, ducts, dipping baskets and similar products fabricated in Ampcoflex.

Copies of Bulletin 9-1 are available upon request to the above company.

Booklet on Blast Cleaning in Non-Ferrous Foundries

American Wheelabrator & Equipment Corp., Dept. MF, 1150 S. Byrkit St., Mishawaka, Ind.

How airless blast cleaning can be used in the non-ferrous foundry to effect reductions in finishing costs of all kinds of castings is shown in a new bulletin. Illustrated case histories in this 4-page booklet cover the brass, bronze, aluminum, and allied fields. Performance data is given, showing how airless blasting can be justified in both small foundries and large ones.

Copies of this bulletin can be obtained from the above manufacturer. Ask for Bulletin 904.

Rectifier Brochure

American Rectifier Corp., Dept. MF, 95 Lafayette St., New York 13, N. Y.

A free brochure explaining the application of rectifiers to various operations has just been made available. In the course of placing its products throughout the country, the company has taken note of questions most frequently asked and has now compiled them, with their replies, in an interesting question-and-answer folder that reveals the many benefits of keeping DC equipment working on AC while retaining DC speed control.

American Rectifiers are made in sizes from 3 to 1,000 K.W. from 50 to 10,000 volts DC, output and either fixed or variable voltage, to accommodate any AC voltage or frequency input.

Unusual Chart on the Composition of Industrial Metals

Sam Tour & Co., Inc., Dept. MF, 44 Trinity Place, New York 6, N. Y.

An unusual metals chart, showing the compositions of all commonly used metals and alloys in industry, has been prepared by the above firm of research and testing consultants. The chart lists the constituent elements and the percentage composition ranges for 60 different classes or types of metals arranged in the following groupings: light metals, irons, steels, cobalts, nickels, coppers, white metals, precious metals, heavy metals and special purpose metals. Also shown is the atomic number and specific gravity of each of the 48 elements commonly encountered in industrial metals.

Rust and Tarnish Removal

Octagon Process, Inc., Dept. MF, 15 Bank St., Staten Island 1, N. Y.

A booklet on rust and tarnish removal by means of their six tailored types of Rustclean has just been published by the manufacturer.

It gives detailed instructions for the use of these new products by wipe-on, spray and hot and cold immersion methods. By following instructions it is possible to remove rust and tarnish, retard corrosion and promote paint adhesion in a single procedure. Heavy, immovable vertical and horizontal surfaces can be treated by use of a special type of Rustclean.

All the products are non-inflammable, non-toxic, non-corrosive and safe to handle. There are no obnoxious or corrosive fumes. Their action is very fast, varying from seconds to minutes depending on the heaviness of the deposits. They prevent the reformation of corrosive elements often accelerated by common pickling acids.

BUSINESS ITEMS

Udylite Names New York District Manager

Appointment of *James L. Clifford* as district manager of the New York sales office was announced by *L. V. Nagle*, vice-president and general sales manager of *Udylite Corp.*

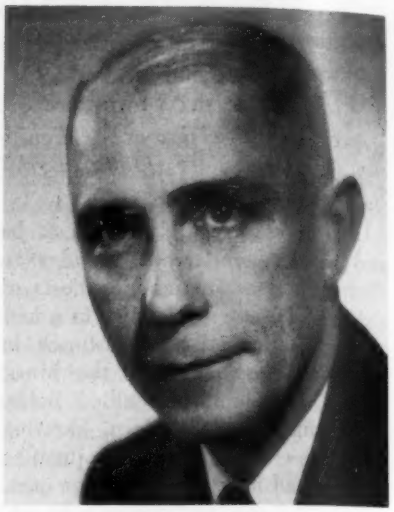
Clifford is named to succeed *A. B. Hoefer*, who recently became a vice-president of the company and vice-president, general manager of the *Frederick B. Stevens, Inc.*, a wholly-owned subsidiary of Udylite.

Born in Long Island City, N. Y., Clifford was graduated from Brooklyn Polytechnic Institute. He joined Udylite in 1941 and has been serving as sales engineer in the New York area. He will assume his duties March 15.

During World War II Clifford served two years as an officer with the U. S. Marine Corps.

James L. Clifford

Frederick Gumm Chemical Appoints Kohler



Arthur S. Kohler

Arthur S. Kohler has recently been appointed technical director of the *Frederick Gumm Chemical Co.*, of Kearny, N. J. He has been connected with the company for over ten years and has served as research director and chief chemist during this time.

Mr. Kohler is a graduate of Polytechnic Institute of Brooklyn, B.S. in Chemistry, 1925. He later took graduate work at Cornell University and Columbia University, where he received an M.S. in Chemical Engineering. Prior to joining the company, he was a professor at Newark College of Engineering for twelve years, where he taught both Chemistry and Chemical Engineering. He is the author of various technical papers and has lectured on cleaning, barrel tumbling, etc. before most of the eastern branches of the A.E.S.

Raybestos-Manhattan, Inc. Moves Chicago Office

Raybestos - Manhattan, Inc. has moved from 445 Lake Shore Drive into its newly constructed Chicago office and warehouse building at 6010 Northwest Highway. This new building provides greatly expanded facilities for warehousing mechanical rubber, packings and asbestos textiles and for Chicago sales offices of these products as well as national sales headquarters for the Equipment Sales Division.

Permutit Promotes Miller

The Permutit Co., New York, N. Y., manufacturer of ion exchange resins and water conditioning apparatus, announces the promotion of *Durando Miller, Jr.*, to the position of assistant technical manager, reporting directly

Durando Miller, Jr.

to *H. L. Beohner*, vice-president. He joined Permutit in 1938 as a member of the sales estimating department and was transferred in 1941 to the technical department, serving there until his new appointment.

Mr. Miller graduated from the Yale School of Engineering, receiving a Bachelor's degree in Civil Engineering in 1938. While at Yale, he was elected to the Tau Beta Pi and Sigma Xi. He has written a number of papers on the various aspects of Sanitary Engineering and served for three years as an instructor of Industrial Water Treatment to classes in Sanitary Engineering at the Graduate School of Engineering, New York University.

Nunan New Executive V.P. of Consolidated Vacuum

Election of *Kneeland Nunan* as executive vice-president and member of the board of directors of *Consolidated Vacuum Corp.* of Rochester, N. Y., newly acquired subsidiary of Consolidated Engineering Corp. of Pasadena, Calif., was recently announced by *Philip S. Fogg*, president of both corporations.

Nunan, former vice-president in charge of sales at Consolidated Engineering will replace *Hugh F. Colvin* at the Rochester operation. Colvin, recently promoted to the office of vice-president and treasurer of the parent company, will return to Pasadena to assume his new duties. He will continue to serve as treasurer and member of the board of directors of Consolidated Vacuum.

Kneeland Nunan

For the two years prior to joining Consolidated Engineering, Nunan was employed by Howard Hughes in various administrative positions. Before that he served for five years as general manager of the Motion Picture Dept. of the Ansco Division of General Aniline and Film Corp.

Receiving his B.S. degree in electrical engineering from the University of Southern California and his master's degree from the California Institute of Technology, Nunan returned to U.S.C. as instructor and head of the Electronics Division of the Electrical Engineering Dept. in 1938. He was subsequent-

Eduardo R. Redlhammer

developments in the rectifier industry.

As sales manager of the Sel-Rex Rectifier Division, Mr. Mitwol will direct the activities of an expanded sales organization for the division.

A veteran of four years of service in the U. S. Navy during World War

Sid Mitwol

II, Mr. Mitwol joined the company four years ago. He received his B.S. degree in Electrical Engineering at C.C.N.Y., and was formerly associated with Federal Telephone and Radio Corp., and Radio Receptor Corp.

ly appointed Assistant Dean of Engineering and Assistant Professor of Electrical Engineering.

During the war years he was appointed to the staff of Columbia University's Division of War Research as associate director of the U. S. Navy Underwater Sound Laboratory at New London, Conn. In 1944 he was transferred to the staff of the Commander Submarine Force, Pacific Fleets, as Director of the Pearl Harbor Laboratory under Columbia University's War Research Division. In July, 1946, on recommendation of the Navy, he was awarded the Medal of Merit by the President of the United States, in recognition of the record achieved in these causes.

Nunan is a member of Tau Beta Pi, Sigma Xi, and Eta Kappa Nu honor societies and has served as president of the General Alumni Association of the University of Southern California, as well as on the board of trustees of that university.

Promote Two at Bart-Messing

Morris M. Messing, president of *Bart-Messing Corp.*, of Belleville, N. J., recently announced the appointment of *Eduardo R. Redlhammer* as vice-president in charge of the Sel-Rex Rectifier Division, and *Sid Mitwol* as sales manager of the same division.

Mr. Redlhammer has been associated with the company since 1947. He was formerly chief engineer in charge of rectifier development. Prior to joining Bart-Messing, the new vice-president studied Electrical Engineering at Penn State, and pioneered many new

American Buff Elects V.P.

The American Buff Co., Chicago, announces the election of *Stanley P. Sax* as vice-president of the company. Mr. Sax is head of sales in the Midwest area, with headquarters in Detroit.

Sax has been affiliated with the company since October, 1948. A Phi Beta Kappa graduate from the University of Wisconsin, he spent 3 years in the Pacific Theater of War, and is now a captain in the U. S. Infantry

Stanley P. Sax

Active Reserves. He is planning an aggressive sales program for 1953 with substantially increased technical assistance to company customers.

Dr. Ralph Schaefer Appointment Announced

Dr. Ralph A. Schaefer

Dr. Ralph A. Schaefer has become vice-president in charge of materials development at *Clevite-Brush Development Co.*, president *A. L. W. Williams* announced. Schaefer has been director of research at *The Cleveland Graphite Bronze Co.*, which, like Clevite-Brush, is a unit in the Clevite group of companies.

Dr. Schaefer first joined Cleveland Graphite in 1936 as a research chemist, and has done advanced work in electroplating and powder metallurgy and their allied fields. He is a vice-president of the *American Electroplaters' Society*, and has been active in the *Electrochemical Society* and the *American Society for Testing Materials*. Dr. Schaefer is 40, is married, and has four children. Their home is at 18028 Hiller Ave., Cleveland.

John F. Maisch Elected Treasurer of E. F. Houghton & Co.

John F. Maisch was elected treasurer of *E. F. Houghton & Co.*, Philadelphia, by the board of directors at the organization meeting following the annual stockholders meeting in Philadelphia in February.

Mr. Maisch has been controller of the company since June, 1950, when he came to Houghton from Lybrand, Ross Bros. and Montgomery, a Philadelphia accounting firm. He succeeds *Wm. F. MacDonald* who has been holding the offices of president and treasurer but has relinquished the latter in order to give more time to his duties as president.

At the annual stockholders' meeting *Major A. E. Carpenter* was re-elected chairman of the board, and *Wm. F. MacDonald* was renamed president. Directors also re-elected were: *Mrs. E. A. Carpenter, A. E. Carpenter, Wm. F. MacDonald, R. H. Patch, D. J. Richards, C. H. Butler, H. B. Fox, J. T. Eaton, D. C. Miner,* and *W. K. Barclay.*

Promat Appoints Three Sales-Service Executives

Gilbert B. Valentine has been appointed sales manager of technical

processes for *Promat Division, Poor & Company*, Waukegan, Ill., electroplating chemicals and processes. He was formerly employed by *Wagner Bros., Inc., McGean Chemical Co.* and *Westinghouse.*

Mr. Valentine received both his Bachelor's and Master's degrees in Chemical Engineering from Case Institute, Cleveland. During World War II he was a Lieutenant Commander in in the Navy.

William F. Mooney was appointed sales manager of industrial products. Formerly he was engaged by Mackley Products, selling lubricants and coolants. Mooney received his B.S. degree in Chemical Engineering from San Francisco University. During World War II he was a drawing compound specialist in ordnance work.

Charles J. Davoli has been made Eastern service manager, working out of the office of *Reynolds-Robson Supply Co.*, Philadelphia. Davoli received his Bachelor of Science degree in Chemistry from the University of Miami, Oxford, Ohio and his Master's degree from the University of Pennsylvania. During World War II he served 7½ years as a Lieutenant in the Navy.

Frasor Named Purchasing Agent for Diversey Corp.

Francis J. Frasor has been named purchasing agent for *The Diversey Corporation*, Chicago, it has been announced by *O. E. Soderberg*, administrative vice-president.

Frasor has had 14 years experience in the purchasing field. Prior to joining Diversey he served as procurement

Francis J. Frasor

coordinator for the Koppers Company, Inc. of Pittsburgh in their Chicago office. He was born in Hartford, Conn., is married and now resides with his wife in Riverdale, Ill., southern suburb of Chicago.

Norton Change of Address

The New York City domestic sales offices of the Abrasive Division, Grinding Machine Division, and Refractories Division of *Norton Company*, Worcester, Mass., formerly of 61 Broadway, have moved to Green and North Street, Teterboro, N. J., effective March 23.

Their new headquarters at the *Behr-Manning* warehouse and office at Teterboro (a Norton Company affiliate), have been established to improve service to customers in the New York industrial area. Expanded telephone coverage (four trunk lines for New York service and four in New Jersey), ample parking facilities, and being generally closer to users of grinding wheels, grinding machines and refractories, makes this a more accessible location.

The office of *Norton Behr-Manning Overseas, Inc.*, will remain at 61 Broadway, New York 6, N. Y.

Bart Corp. Opens New Plant

S. G. Bart, president of *Bart Manufacturing Corp.* of Belleville, N. J., has announced completion of a second new building on the six-and-a-half-acre industrial tract of the corporation in Newark, N. J. The new building, comprising approximately 12,000 square feet of production space, will be used exclusively for precision electroplating of heavy industrial equipment being

produced for Atomic Energy Commission projects.

Completion of the new plant marks the second step in the expansion program of the company and affiliated companies, *Bart-Messing Corp., Bart Laboratories Co., Inc., Bart Products, Inc.,* and *Sel-Rex Precious Metals, Inc.* The first plant on the new tract was opened last spring for Bart Products, Inc., which is also heavily engaged in production for A.E.C. projects.

Additional buildings totaling approximately 100,000 square feet of space are contemplated for the site where activities of all of the companies will eventually be consolidated. The affiliated companies now operate six plants in the Newark-Belleville area for the manufacture of plating equipment and supplies and in the production of specialized types of heavy industrial precision plating where close tolerances are required.

H. M. Anderson, Jr. Appointed as Assistant to President of Surface Chemicals, Inc.

Harry M. Anderson, Jr. has been appointed assistant to the president, in charge of *Surface Chemicals, Inc.,* division of *The McKay Co.* In his new position as assistant to *James C. McKay,* president, Anderson will direct the research, manufacturing and sales program for the company's extensive line of specialty finishing products and chemical resistant finishes. He will make his headquarters at the company's laboratories and plant in McKees Rocks, Pa. Plans call for the expansion of the company's activities to include the developing and manufacturing of all types of finishes for every use in all industries.

H. M. Anderson

Mr. Anderson brings to the company a broad background of experience in the coating field. Prior to his present appointment, he was with the Chemical Division of the *General Electric Co.* in Cleveland. He holds a degree in chemical engineering from the University of Pittsburgh and is an active member of the *American Chemical Society* and other professional and business groups.

Diversey Purchases Firm in Honolulu

The Diversey Corp., Chicago, has taken another step in the progressive expansion of its activities with the purchase of the *Kills'Em Chemical Co., Ltd.,* of Honolulu, Hawaii, it has been announced by *H. W. Kochs,* Diversey's chairman.

The new subsidiary is engaged primarily in the manufacturing of disinfectants and insecticides in the Hawaiian Islands. It also operates one of the largest service organizations in the Islands for the control of termites in homes and public buildings.

Diversey is a leading producer of sanitation chemicals for the food industries; industrial oil absorbents; cleaners used in preparing metal surfaces for finishing operations; industrial clays and insecticides. The modern, well equipment plant of the Kills-'Em Chemical Co., with a few additions, will be ideally suited for the manufacturing of Diversey products. With this acquisition Diversey will be the first manufacturer of food plant sanitation chemicals in the Territory of Hawaii.

Chicago Vit Promotes Johnson, McLaughlin

L. A. Johnson

John McLaughlin

A. S. Ault, vice-president, sales, *Chicago Vitreous Enamel Product Co.* has announced the promotion of *Lee Johnson* to assistant manager of service, a position formerly held by *John McLaughlin* who will now devote his full time to special projects.

Lee Johnson joined Chicago Vit in April, 1937 as a chemist and worked primarily on raw materials and frit analyses. During the war he helped to set up the chemical control procedures necessary in the production of thermit, dried eggs and armor plate. At the end of the war he was transferred to the ceramic laboratory to work on research and development of new frits. In 1949 he was promoted to the sales and service organization as a service engineer.

McLaughlin became associated with Chicago Vit in June, 1937 following

his graduation from North Carolina State College. He spent several years in the research laboratory and then went to Baltimore Enamel Novelty Co. from June of 1940 to November of 1940. After almost five years of military service, during which time he rose to the rank of Major, he rejoined Chicago Vit in October of 1945 as a member of the research division. He was transferred to the service staff in 1947. In April, 1950 he was named assistant manager of service. During the past year and a half, he has concentrated his activities on special development projects, one of the most important being the enameling of television cones.

Buffalo Electro-Chemical Co., Inc. Appoints New Sales Executives

John F. Shea, formerly northeastern district sales manager of *Buffalo Electro-Chemical Co., Inc.* and a member of the sales force since 1930, has

John F. Shea

Fred N. C. Jerauld

been appointed general sales manager, it was announced today by *Dr. Max E. Bretschger,* president of the company. Mr. Shea will make his headquarters in Buffalo, N. Y.

Dr. Bretschger also announced the appointment of *Fred N. C. Jerauld,* formerly assistant to the president, as manager of sales promotion. Mr. Jerauld has been with the company since 1936.

Bernard Chemical in New Quarters

The *Bernard Chemical Products Co.,* manufacturer of industrial cleaning compounds, has moved its offices and plant to 98-21 Linden Blvd., Ozone Park 17, N. Y.

Metalwash Appoints Ohio Representative

Metalwash Machinery Corp. of Elizabeth, N. J., announces expansion of sales activities in the Ohio territory with the appointment of *William F. Ross* by the *J. E. Von Maur Co.* of Columbus, Ohio, Metalwash sales representatives in Ohio, Eastern Indiana and Kentucky.

Mr. Ross, formerly sales engineer, designer, and erection engineer with The Electric Furnace Co. has a wide and varied experience in the heat-treating and metal working industries, contributing frequently authoritative articles to the trade press, as well as to Watkins "Encyclopedia of the Steel Industry."

Distribution & Warehousing of Enthone Products

Warehousing facilities for the metal finishing chemicals of *Enthone, Inc.,* New Haven, Conn., in Cleveland, Ohio, were established on April 1 by the appointment of *R. O. Hull & Co.,* Cleveland, as exclusive distributors of Enthone products in the states of Ohio and West Virginia, the western portion of Pennsylvania, part of Western New York including the Buffalo area, and northeastern Kentucky. Sufficient stocks of Enthone chemicals will be maintained by R. O. Hull & Co. to enable shipments from Cleveland on an F.O.B. Cleveland basis.

R. O. Hull & Co. has been distributing Enthone products for many years in Ohio. The recent change in policy will result in making these products more available over a wider area and will extend the service to this area since Hull engineers will be assisted by an Enthone service engineer, *Joseph E. Rhoads,* who will make his headquarters at the Cleveland offices.

Through the active cooperation of *Ardco, Inc.,* Chicago, Illinois, Enthone has also extended their service and the sale of their metal finishing chemicals in the midwest. Effective April 1, Ardco became exclusive distributors of Enthone products in western Michigan and the state of Indiana in addition to their former territory of Illinois, Wisconsin, Iowa and Minnesota. Warehouse stocks of chemicals are maintained by Ardco in Chicago. Enthone service will be extended to this area by *Robert Goodsell* of Enthone, whose headquarters remain at the Ardco Chicago offices.

Distribution of Enthone chemicals in Canada and warehousing of many of their products will be handled by *Armalite Co., Ltd.,* Toronto. Active coverage of the provinces of Quebec and Ontario is accomplished by their sales engineering staff.

Northwestern University Scholarships Available

Two full-tuition, five-year scholarships for the Northwestern University Technological Institute have again been granted by *Belke Manufacturing Co.* for students entering this fall.

The University's cooperative program alternates college work with actual work periods in industry over a five-year program for the degree of Bachelor of Science in Engineering.

The Belke Scholarship covers tuition

for the five-year period. The student receives the prevailing wage scale for the industry work periods, which enables him to be very near self-supporting.

Upon enrollment students attend college one and one-half years, then alternate between twelve-week periods in industry and twelve-week periods in college covering mathematics, chemistry, physics, mechanical and electrical engineering, and other subjects.

The periods in industry include work at the Belke plant, at other plants that manufacture plating equipment and in the plating departments of manufacturers, as well as job plating shops.

Admission requirements of the Northwestern University Technological Institute include average high school grades in the upper quarter of the class, with three and one-half units of high school mathematics.

Further information will be supplied promptly on request to *Raymond W. Kotz, Belke Manufacturing Company*, 947 N. Cicero Ave., Chicago 51, Ill.

Weisberg in New Location

Dr. Louis Weisberg, chemical engineer, has moved his office to 10 East 39th Street, New York 16, N. Y. His new telephone number is MUrray Hill 5-5542.

Permutit Moves West Coast Sales Office

The Permutit Co., New York 36, N. Y., manufacturers of industrial and household ion exchange equipment and ion exchange resins for all types of water conditioning applications, announces the removal of its Los Angeles sales office to a new location at 302-B South Brand Blvd., Glendale 4, Calif.

George A. Swem will continue in the capacity of industrial sales engineer while household sales will continue under the direction of *J. H. Mosher*, Pacific Coast regional manager.

Inco's Quarter Century Club Welcomes 17 New Members

Seventeen new members were welcomed into the Quarter Century Club of the *International Nickel Company* at the Club's annual dinner recently at the Hotel Statler, New York City, by *Dr. John F. Thompson*, Chairman of the Board of International Nickel.

The Club now has a membership of more than 1,900 active or retired employees in the United States, Canada and the United Kingdom. There are 173 members in the metropolitan New York area.

Ten of the new members are in Inco's New York Office, six are with Whitehead Metal Products Company, Inc., a subsidiary of International Nickel, and the other is employed at Inco's Research Laboratory at Bayonne, New Jersey.

Formation of New Concern

Messrs. Young, Crisera, Gottlieb and *Neustadt* are pleased to announce the formation of a new company, the *Auromet Corp.*, with offices and laboratory located at 267 Elizabeth St., New York 12, N. Y. The personnel of this new firm, formerly connected with *A. Robinson & Son*, are experienced in the field of electrodepositing gold, silver, platinum, palladium and rhodium.

Auromet Corp. will manufacture precious metal solutions and salts; scrap metals and solutions will be refined.

Berman Elected President of Industrial Metal Protectives, Inc.

Joseph E. Berman has been elected president and chairman of the board of directors of the seven-year-old *Industrial Metal Protectives, Inc.*, Dayton, Ohio, manufacturers of Zincilate, a substitute for galvanizing.

Berman succeeds *H. A. Toulmin, Jr.*, who sold his interest in the firm.

Other officers are *John R. Fisher, Jr.*, vice-president in charge of engineering; *Franklin O. Blechman*, New-

port News, Va., secretary, and *Nancy L. Sheets*, assistant secretary and treasurer.

Directors include *H. L. Young*, of American Zinc, Lead and Smelting Co., St. Louis; *E. J. DeWitt*, president of Wallace Tube Co., Chicago; *Blechman* and *E. E. Falk* of Newport News.

Norton Opens New Plant

Norton Company of Worcester, Mass. took the wraps off the new $6,000,000 expansion of its Grinding Machine Division March 31 when editors of newspapers and technical magazines toured the plant, the first group to visit the new structure since it was completed. Editors' Preview was the opening event in a week-long Open House. Shown publicly for the first time, this plant provides increased capacity for the production of Norton's complete line of 45 different types of precision grinding and lapping machines.

The new plant, built to meet the demands of the present defense effort, consists of a 740-foot by 300-foot factory joining a 360-foot by 100-foot office building. A large parking area for employees and visitors adjoins the plant.

Among the many features of the new plant are straightline production methods, new modern machine tools, special materials handling equipment, air-recirculating dust control equipment, forced ventilation providing three complete air changes per hour, and many others.

Vanott Personals

Fred W. Voss

Chief Engineer of *Vanott Machine Corp.* 216 Colgate, Buffalo, N. Y., has completed 40 years as a design engineer and has specialized on machines for polishing unusual shaped parts — holding devices, cams, etc. He also has to his credit the design of many unusual machine tools.

John A. Pazder

Superintendent of the *Vanott Corp.* He started as a machinist in 1918 and has been with Vanott for 23 years. He supervises construction of each Vanott polishing machine and personally checks each machine or chuck before it is released for production.

American Cyanamid Elections

L. C. Perkinson was elected vice-president and *G. C. Walker* was elected treasurer of *American Cyanamid Co.*, it was announced recently. Mr. Perkinson had been treasurer of Cyanamid since 1945 and a director since 1946. Mr. Walker had been assistant treasurer since 1951.

A graduate of Columbia University, Mr. Perkinson joined the Hanover Bank in 1917 and practiced as a public accountant for a short period before becoming associated with Cyanamid in 1921. In 1939 he was elected assistant treasurer and comptroller. He is a director of Southern Minerals Corp., and Jefferson Chemical Co., Inc. and is an officer and/or director of numerous Cyanamid subsidiaries.

Mr. Walker joined Cyanamid's accounting department in 1933, became assistant manager of the tax department in 1939, and manager in 1945. He is a graduate of New York University.

National Lead Expands Metal Department

National Lead Co. will operate its newly-acquired *Pioneer Alloy Products Division* as a part of its metal department. it was recently announced by *W. J. Welch*, manager of the department. Pioneer Alloy's production consists of corrosion-resisting valves, with wide application in the chemical processing and refining industries, and heat-resisting and acid-resisting castings for general industrial use.

This production rounds out the company's metal department output, with a line of stainless steel valves supplementing its lead valves. Other products include lead pipe, sheet lead, traps and bends, solder, bearing metal, printing metals, storage battery metal, acid concentrators, acid pumps, lead lined valves and fittings, and other similar products for the chemical, building, petroleum and steel industries.

Bryson Appointed by Hooker

Harry W. Bryson, Jr. has been appointed sales service representative of *Hooker Electrochemical Co.* at Tacoma, Washington according to an announcement made by *T. E. Moffitt*, western manager of the company. His activities cover service on caustic soda, chlorine and ammonia. His territory includes the Pacific Northwest states, British Columbia and Alaska.

He has been employed by Hooker since 1950 in the process study group; is a veteran of World War II and was graduated from Washington State College with a B.S. in chemical engineering in 1942.

New Plant for Circo Cleaning Equipment

Topper Equipment Co., manufacturers of Circo vapor degreasing equipment, metal parts washers, dryers, solvent recovery stills, steam cleaners, Circo-Solv (trichlorethylene) and Per-Solv (perchlorethylene) has recently completed and moved into a new and modern manufacturing plant at Rahway, N. J.

The 40,000 square foot new building was constructed especially for Topper's requirements in the manufacture of metal cleaning equipment. It includes such special facilities as metallizing and blasting rooms, traveling craneways, extra-thick concrete floors for the type of equipment required.

In addition to being located adjacent to the famous New Jersey Turnpike and the Garden State Parkway, this new plant is located on the Lehigh Valley Railroad.

Research Corp. Announces Grant for Study of Oxide Film

A $5,000 grant for aid in the study

of oxide film, with a view to growing protective films on metals, has been made by *Research Corporation* to *Stevens Institute of Technology*, Hoboken, N. J., the Institute announced today. The gift is called the Harvey Nathaniel Davis Grant in honor of the late president of Stevens.

Robert B. Green, associate professor of physics, who is in charge of the project, described it as the first attempt to use the electron microscope and electron diffraction simultaneously to study the growth and structure of oxide films. The eventual objective of the work is to develop methods of producing oxide films that will protect metals from corrosion. Pure aluminum and nickel form self-protecting oxides naturally, Dr. Green noted, but other metals, notably the iron group, are not protected by their oxides and continue to corrode indefinitely. If oxidation could be arrested near the surface in iron and steel, Dr. Green pointed out, much waste in industry due to corrosion could be averted.

Zinc and aluminum will be studied first, with the prospect of studying iron when techniques are perfected. Aspects studied will include discontinuities, cracks, wrinkles, and the location of these features in relation to the original surface. Fresh surfaces will be produced both by the fracture of single and polycrystalline specimens, and by cleaning of surfaces that have not been subject to plastic flow. Dr. Green proposes to grow single crystals of aluminum and zinc, in order to study the effect of crystal orientation.

New District Manager for Pangborn Corporation

John C. Pangborn, Jr.

John C. Pangborn, Jr., son of 1st vice-president *John C. Pangborn*, has been appointed Hagerstown district sales manager by the *Pangborn Corp.*, Hagerstown, Md.

The Hagerstown sales district was recently formed and consists of a number of counties in central Pennsylvania, most of West Virginia with bordering counties in Ohio and Kentucky and the western section of Maryland. Headquarters for this district will be at the Hagerstown plant.

Mr. Pangborn's promotion follows years of experience in the blast cleaning and dust control fields. After completing his education at the University of Pittsburgh, he served in many capacities in the office and shop, learning all phases of the business. Since returning from duty with O.S.S. in World War II he has served as an erector of Pangborn machines, as manager of the Erecting and Service Division, as sales engineer in Detroit and for more than a year was Pangborn representative in Boston. From 1951 until his recent promotion he has served as expeditor and assistant head of department in purchasing.

Dow Opens Minneapolis Sales Office

The *Dow Chemical Co.* announces the opening of a new sales office in Minneapolis to serve the growing chemical markets in Minnesota, the northern half of Wisconsin, and the Dakotas.

Donald Williams, director of sales, said the new office is expected to provide better service for customers in

the four-state area who formerly were contacted through the company's Chicago office. The Minneapolis office will function at the outset as a branch of the Chicago office, he said.

In addition to the new office, Dow maintains sales offices in twelve other major cities throughout the country.

Metalweld, Inc. Installs New Equipment

The *Protective Coatings Division* of *Metalweld, Inc.* has installed, in their new Scotts Lane Plant, one of the largest rubber vulcanizers in this area, for the joining of hard and soft rubber sheets to steel.

Hotchkiss Elected Chairman of Board at Cro-Plate

At a meeting of the board of directors of *The Cro-Plate Co., Inc.*, held recently, *Eugene B. Hotchkiss* was elected chairman of the board. Mr. Hotchkiss has been a director of the company since 1949.

The election of Mr. Hotchkiss represents the latest step in the development of the company, rapidly growing manufacturer of pressure blast metal finishing equipment and chromium plating units. Founded in 1946 as a small two-man job plating shop, the company is one of the many new manufacturing industries that have prospered from the development of new metal finishing techniques.

Mr. Hotchkiss is also vice-president of New Enterprises, Inc., Boston venture capital firm, president and director of Infra-Roast Inc., treasurer and director of Vibro Engineering Co., Inc. and a director of Kaman Aircraft Corp.

Eugene Hotchkiss

OBITUARIES

A. A. APONICK

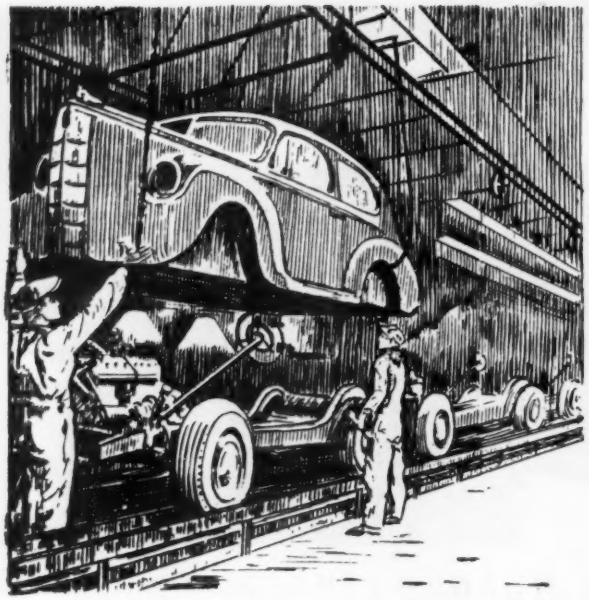
A. A. Aponick, 41, sales representative of the *Park Chemical Co.*, of Detroit, Mich., died at Cincinnati, Ohio on March 14.

JACOB HAY

Jacob Hay, founder of the *Jacob Hay Co.*, died on March 21.

He is survived by the widow, Josephine; a son, Lawrence J., and five daughters, Mrs. Theresa De Loof, Mrs. Mary Kaye, Mrs. Ann Morley, Mrs. Catherine Hoge and Mrs. Rita Gardino.

Jacob Hay



MOTOR CITY PLATING NEWS

Udylite Names Hoefer V.P. and Announces other Assignments

Election of *August B. Hoefer* as vice-president of *Udylite Corp.* and vice-president and general manager of *Frederic B. Stevens, Inc.*, was announced by *L. K. Lindahl*, president of Udylite.

Hoefer joined the Udylite Corporation in November, 1928, after graduation from Purdue University with a degree in Chemical Engineering. He went to the New York branch of the company in October, 1929, as a sales engineer. He became New York district manager in 1939.

Hoefer has returned to Detroit and will assume his new duties April 1.

Frank Reha will be sales engineer

August B. Hoefer

Frank Reha

Louis J. Minbiole

in the Michigan territory for the *Udylite Corp.*, *L. V. Nagle*, Udylite vice-president and sales manager announced.

Reha will take the position vacated

by *Louis J. Minbiole*, who recently was named assistant sales manager of Udylite Division of the company.

Graduated with the degree in chemical engineering from Lawrence Institute of Technology, Reha joined Udylite as a chemist in 1939. First serving as field service engineer in the Michigan territory, he later joined the Indianapolis sales office as sales and service engineer.

Reha has been connected with the metal finishing field for the past 17 years. He assumed his new position April 1.

Mr. Nagle also announced the appointment of *Louis J. Minbiole* as assistant sales manager of the firm.

Minbiole joined Udylite in 1946 as a sales engineer in the Michigan territory. He was graduated from Wayne University College of Engineering in 1940. A year later he was awarded a master's degree in chemical engineering from Massachusetts Institute of Technology. Prior to joining the company, Minbiole was associated with Buick Division of General Motors Corporation.

Detroit Branch of the A.E.S.

Something new was tried by the Branch. Since many of the members' wives have wondered for a long time what goes on at an Electroplaters' Meeting, it was decided to have a Ladies Night with a program of interest to members and wives alike.

This Ladies Night took place on Friday, March 6, in the Hotel Statler with approximately 160 members, wives, and guests present. President *H. E. Head* called the meeting to order at 8:15 P.M. and introduced Second National Vice-President *Ralph Schaefer, Past* National President *Cleve Nixon*, and the Officers of the Detroit Branch.

Joe Gurski, Secretary-Treasurer, read the names of seven applicants for membership. All were unanimously elected into the Branch.

Delegate Cleve Nixon reported on the Interim Meeting in Columbus, Ohio, on January 10, 1953. Nixon said that there was considerable discussion regarding the number of technical papers being submitted to *Plating* magazine. There is a need for more technical papers and some at the meeting avocated paying for technical articles. The majority, however, decided against such a procedure. It was felt that papers should be submitted for the prestige so gained.

Nixon also said that the annual proceedings are to be enlarged to include all technical articles from *Plating* as well as technical papers presented at the annual convention. This can be done at no added cost thanks to the work of Second National Vice-President Ralph Schaefer. Nixon urged everyone to read the editorial in the March issue of *Plating* magazine which deals with this in further detail.

Nixon also said that *Leonard Weig* of the Rockford Branch has proposed that the society be broadened to include allied fields such as barrel finishing, painting, polishing, and similar processes. This proposal is now under study.

The meeting was then turned over to Educational Chairman *Fred Olmstead* who showed the colored movie "We Discovered Tampa" which provided an interesting film journey into Florida's tropical vacationland. Also shown were a number of slides from Aunt Ella's luncheon at the 1952 National Convention in Chicago which was of particular interest to the ladies.

Mr. Olmstead introduced the principal speaker, *William Carr*, who delivered a most interesting talk on "The Principles of Guided Missiles."

For the next 55 minutes, such modern day wonders as aircraft-auto pilots, buzz bombs, jet missiles, and similar modern wonders were discussed and explained in a non-technical and most enjoyable fashion.

One of the many amazing facts Mr. Carr mentioned was that, with present-

day knowledge of auto pilots and guided missiles, it is possible to fly a V-2 type missile half-way around the world and hit a target 300 yards in diameter.

Many interesting questions followed Mr. Carr's talk and before the evening was over, such things as flying saucers and trips to Mars were discussed in detail.

President Head closed the meeting at 10:10 P.M., thanking the wives for attending, and suggesting that all have refreshments which were immediately served following adjournment.

E. J. Kubis
Publicity Chairman

New Research Laboratories Inspected by Wyandotte Chemicals District Mgrs.

Wyandotte Chemicals district sales managers recently made a half-day inspection tour of the soon-to-be-opened research laboratories. Equipment in the new industrial laboratories should be completely installed in May.

This inspecting group (one of three) was photographed in the laboratory containing an interchangeable six-stage, variable speed, power spray washer. Manufactured to unusual specifications by *Metalwash Machinery Co.*, this 30-foot long machine can duplicate the operating cycles of nearly every metal fabricator and will handle acids, alkalies and emulsions.

Rectifiers connected to a 17 tank cleaning and plating installation are shown back of group who are, left to right—*Robert Racine*, manager industrial sales; *Robert Tucker*, St. Louis district manager; *Jack Munshaw*, Winnipeg resident manager; *P. S. Spencer*, San Francisco district manager; *M. L. Lloyd* and *A. J. Frieling*, home office assignment; *Andy Liger*, supervisor industrial research; *J. L. Ramsey*, manager railroad sales: *W. C. Van Keuren*, Philadelphia district manager; *P. N. Burkard*, manager industrial, railroad and aircraft department; *W. C. Dawkins*, sales operating assistant and *Ed Kubis*, technical service.

Additional equipment in the new industrial laboratories includes buffing equipment, complete burnishing equipment and a paint spray booth. Also available is a salt spray booth, small spray washer for experimental runs, constant temperature and humidity rooms, plus the laboratory installations.

Also contained in the new research center is a nucleonics laboratory where soils are tagged with radioactive tracers and the efficiency of various cleaning operations and materials is measured with Geiger counters.

NEW BOOK

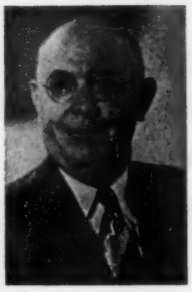
Steels in Modern Industry

Edited by W. E. Benbow. Published by Iliffe & Sons Ltd., Dorset House, Stamford St., London S.E.I., 1951. Price: 42s. Od (Postage 11d). 562 pages, with 260 illustrations.

Prepared by the editor of the British magazine *Iron and Steel*, this volume was planned by a committee of eminent British engineers and metallurgists. It comprises a comprehensive survey by 29 specialist contributors of the metallurgy and treatment of the principal types of steels, including a full subject index and selected bibliographies. For metallurgists and shopmen who handle steels it should provide an interesting comparison between British and American methods of treatment and application.

News from California

By Fred A. Herr



One of the most interested spectators at the annual educational session of Los Angeles A.E.S. Branch on March 22 was genial *Louis E. Shaw*, now living in retirement in Compton, Calif., who was active in mid-west plating circles from the turn of the century until his retirement in 1943.

Mr. Shaw's eyes twinkled as he commented on the imposing titles of some of the speeches being made. "We never heard of ultrasonics when I worked for Koch's Barber Supply Co. in Chicago, Aurora Plating Works in Aurora, and Arcade Mfg. Co. in Freeport, Ill. nearly 50 years ago," he remarked. "We plated bowling machines and barber shears in the good old-fashioned way."

Mr. Shaw went to work in the Aurora shop in 1907 and subsequently served a long term with Koch's Barber Supply Company in Chicago. He still carries in his wallet a faded and much creased letter of recommendation received from Robert C. Koch, vice-president, 25 years ago. The cherished letter bears the date of August 22, 1928.

Mr. Shaw was with the Chicago Plating Co. when chromium plating came into the picture. "The saying was, 'Chrome made good nickel platers," he observed. "Before the arrival of chromium, nickel plating was undependable and it was common for the nickel deposit to come off. With chromium, all us nickel platers became much better nickel platers."

Mr. Shaw became a member of Chicago Local No. 6, Polishers, Buffers and Platers Union, in 1908. He was well acquainted with the leading figures of the middle-west plating industry in the early decades of this

century. He knew the late *Ernest Lamoreux* as an enterprising salesman for *Hanson-Van Winkle-Munning*, covering the mid-west territory; was a good friend of *Clarence Thornton*, when Mr. Thornton was attached to *L'Hommedeau's* Chicago office and served as secretary of Chicago A.E.S. Branch. The names of *Oscar Service*, *Frank Hanlon* and other beloved characters of the early days rolled off his tongue as he reminisced of the times when, as he put it, "both the plating industry and I were a lot younger."

Mrs. Joan Trumbour Wiarda, sales manager of *Finishing Publications, Inc.*, spent a busy week in Southern California in mid-March. She devoted several days to renewing contacts with plating equipment manufacturers and suppliers; attended the annual dinner dance of Los Angeles A.E.S. Branch at the Hotel Statler; and visited the Western Metal Show at Pan Pacific Auditorium, the Western Metal Congress, and the convention of the *American Chemical Society* at the Statler. To all those in the California plating industry on whom Mrs. Wiarda called, but with whom she missed contact, she sends herewith her best wishes and the hope that she may be able to offer the greeting in person on her next trip to the West Coast.

Supplementing a brief news mention which appeared in a recent issue of METAL FINISHING on Certified Chrome Furniture Co's. new plating shop at El Segundo, Calif., *Ernest Bustamente*, plating foreman, submits the following detailed figures:

The plating room in the 1¼ milion dollar furniture factory occupies a 100 x 100 foot area and employs 35 men in plating, polishing and buffing activities. The new shop is equipped with high-speed copper, chromium, bright nickel, and white brass plating facilities. Equipment includes one 3,200 gallon copper, two 3,200 gallon nickel, one 2,000 gallon white brass and two 2,000 gallon chromium tanks. Tank dimensions average 4½ feet in width, 20 feet in length, to accommodate chromium barrel chairs, setee chairs, dinette furniture and other bulky items. Two 2,500 amp. and two 1,500 amp. rectifiers, and manually operated belt polishing facilities have been installed. *A. A. Levine* is president, *Robert Bibeau*, general manager.

The growing importance of the Pacific Coast as a key area for the distribution of finishing industry machinery and supplies was highlighted in March by the number of top executives of mid-western and eastern manufacturers who made business trips to Los Angeles.

Among those who came west for conferences with *Arthur D. Gaskin* and *Alfred E. Perkins*, operators of *Alert Supply Co.*, Los Angeles, were the following: *C. I. Packer*, president, *Packer Machine Co.*, Meriden, Conn., manufacturers of automatic buffing equipment; *H. A. Montgomery*, president, *H. A. Montgomery Co.*, Detroit, Mich.; producers of drawing compounds; *Lloyd Portzen*, president, *Smoothex, Inc.*, Cleveland, O., manufacturers of bright plating solutions; *Sherman Gobles, Federated Metals, Inc.*, New York, anode manufacturers; and *R. A. Cole*, vice-president, and *R. B. Robinson*, sales manager of the *Production Machine Co.*, Greenfield, Mass., producers of polishing and finishing equipment and abrasive compounds.

To those of the eastern contingent who had their first opportunity to inspect the facilities of Alert Supply Co., the modern production, display and distribution setup of the firm came as a distinct surprise. Alert is one of the newer additions to the ranks of Southern California plating supply manufacturers and distributors, but has won its way to a leading position. Gaskin and Perkins established the firm in March, 1950, following an association with the *L. H. Butcher Co.*, Los Angeles, respectively, as chemist and sales engineer. Gaskin's background also covers tenures of service with Bass & Company in England, *Pennsylvania Salt Co.*, Bruce Products Co., and the H. A. Montgomery Co. Their 10,000 square foot plant at 4755 East 49th St., Los Angeles is equipped for manufacturing buffing compounds for direct distribution to West Coast users.

King Ruhly, sales manager of the chemical division, *Michigan Chrome & Chemical Co.*, Detroit, Mich., flew into Los Angeles April 5 for a week's conferences with executives of the *A. J. Lynch Co.* at Los Angeles and San Francisco, his firm's western distributors. He attended the April 8 meeting of Los Angeles Branch, A.E.S., with *William Nairne*, supervisor of the Lynch Co.'s plating supply division at Los Angeles, and *Harold R. Smallman*, western manager for *Hanson-Van Winkle-Munning Co.*

Distinguished out-of-town members of the plating and allied fraternity who were in Los Angeles during March to attend the sessions of the *American Chemical Society* and the *American Electroplaters' Society*, included the following:

Dr. D. T. Ewing, professor of chemistry, Michigan State College, and Mrs. Ewing; *Clifford Stavesek*, Green Chemical Co., New York; *J. M. Simel*, supervisor of plating, Schlage Lock Co., San Francisco; *Mrs. Joan Trumbour Wiarda*, sales manager, *Finishing Publications, Inc.*, Westwood, N. J.; *J. R. Pettinger*, manager, *A. J. Lynch Co.* at San Francisco; *R. O. Hull*, president, *.R O. Hull Co.*, Rocky River, O.; and *Herbert De Long*, *Dow Chemical Co.*, Midland, Mich.

A. L. Specer, owner of Travis Plating Co., Inc., Venice, Calif., reports

completion of an expansion program involving installation of a chromic acid anodizing setup. New tank facilities for 960 gallons of solution have been installed. The shop specializes in color anodizing of aircraft parts and also functions as a general job shop. *Sundmark Supply Co.*, Los Angeles, made the installation.

E. G. "Dick" Richardson, who just retired as 2nd vice-president of Los Angeles Branch, A.E.S., reports he is now affiliated with Cadmium & Nickel Plating Co., Los Angeles, as night foreman of plating. He formerly was co-owner of Progressive Plating Works, Long Beach, Cal.

J. William Grant, vice-president of *Electro Chemical Engineering & Mfg. Co.* of Emmaus, Pa., is now directing the affairs of the firm's West Coast branch at 385 East Green St., Pasadena, Cal. The company specializes in the design and construction of acid handling equipment, rubber and resin linings, acid and alkali-proof cements and coatings. Its chief interest, insofar as electroplaters are concerned, centers on acid proof flooring, pickling tanks, gutters, sewers, ducts and the like.

Associations and Societies

AMERICAN ELECTROPLATERS' 40th ANNUAL CONVENTION

Philadelphia June 15 to 18

Convention plans have progressed to the point where all but the last minute arrangements have been completed and every one of its many phases has been carefully planned and executed under the direction of General Chairman *Sam Heiman* of *Philadelphia Rustproof Company*.

Hotel arrangements are running smoothly; the technical program has been carefully balanced; the social program offers the old favorites and something new; the Ladies' Program is tops; and the city of Philadelphia wants to extend its welcome!

The Educational Committee under Chairman *Fred Fulforth* has arranged a program that represents an excellent balance between the practical and the academic. The theme of this program will be *"What is new in the plating field,"* and it will be highlighted by a symposium on chromium plating.

For the convenience of our readers METAL FINISHING is listing the technical program in this issue in order that any who are planning to attend the convention for a day or two may pick the date on which the papers in which they are most interested will be presented.

Educational Sessions

MONDAY, JUNE 15, 2:00 P.M.

1. Bright Gold Plating—*Edwin C. Rinker*, Sel-Rex Precious Metals, Inc.
2. Statistical Quality Control—A New Tool for the Electroplater. *Ezra A. Blount*, Products Finishing.
3. A Corrosion Study of Various Chromium-Plated Electrodeposits —*Henry Brown* and *Edwin Hoover*, Udylite Corporation.
4. Iron Plating from an Alkaline Bath—*Edward Foley, Jr., Henry B. Linford*, Columbia University and *Walter Meyer*, Enthone, Inc.

TUESDAY, JUNE 16, 9:00 A.M.

1. Black Chromium-Base Electroplating—*Martin Quaely*, Westinghouse Corporation.
2. Crack Free Chromium—A New Process. *R. Dow* and *J. E. Star-*

Co-Chairmen Sam Heiman and Del Robson checking over the last minute details for the convention.

eck, United Chromium, Inc.

3. Cost Determination in the Industrial Chromium Plating Job Shop —*W. F. Walton* and *P. B. Lonsbury*.
4. Stability of Ion Exchange Resins toward Chromic Acid Plating Solutions—*C. Frederick Paulson*, Permutit Co.

TUESDAY, JUNE 16, 2:00 P.M.

1. A Study of Cyanide Decomposition—*E. J. Serfass* and *R. F. Muraca*, Lehigh University and *Walter Meyer*, Enthone, Inc.
2. Evaluation of Carbonate Removal Methods—*R. Scott Modjeska*, Scientific Control Laboratories.
3. A Further Study of the Effect of Abrasive Metal Polishing on the Character of Nickel Plate—*W. L. Pinner*, Houdaille-Hershey Corp.
4. Plating on Molybdenum — *A. Korbelak*, Plating.

WEDNESDAY, JUNE 17, 9:00 A.M.

1. An Electronic Thickness Gage— *Abner Brenner*, National Bureau of Standards.
2. Thickness of Electrodeposits by the Anodic Solution Method— *C. F. Waite*, King-Seeley Corporation.
3. Testing Organic Finishes and Interpretation of Results—*C. O. Hutchinson*, The Glidden Company.

THURSDAY, JUNE 18, 9:00 A.M.— A.E.S. RESEARCH SESSION

Reports on A.E.S. Research Programs. In addition, two evening programs are planned:

TUESDAY, JUNE 16, 8:30 P.M

General Question and Answer Period. Moderator: *Dr. Abner Brenner*. Panel: Authors of Educational Session Papers.

WEDNESDAY, JUNE 17, 8:30 P.M.

Film: Corrosion in Action— Courtesy of International Nickel Co.

Los Angeles Branch

John Millhorn, manager of the plating supply division of the *Mefford Chemical Co.*, was elected president of Los Angeles Branch, *American Electroplaters' Society*, for the 1953-54 term at the April 8 meeting in Rodger Young Hall.

The election climaxed Millhorn's progression through various other posts during the past several years during which he served the branch outstandingly as second and first vice-president, general chairman of the annual educational session, and at various times as delegate to the Supreme Society.

John succeeded *Myron Orbaugh* of the Bone Engineering Co., Glendale, whose admirable direction of Branch affairs during the past year was acknowledged by the presentation to him, by *Richard J. Wooley* of the board of managers, of an inscribed pen and pencil set.

For the first time in branch history the entire slate of nominees recommended by the committee headed by *Don Bedwell* was unanimously approved and elected. In addition to Millhorn, the new officers are:

First Vice-president, *G. Stuart Krentel*, A. J. Lynch Co., last year's educational committee chairman; second vice-president, *Earl W. Arnold*, L. H. Butcher Co., who was advanced from the secretaryship; secretary, *Truman Stoner*, Chief Products Co.; treasurer, *Norman McCune*, Virtue Brothers Co.

Board of Managers: Orbaugh (Chairman), Wooley and *Roy Lostutter*; Delegates: *Morton Schwartz*, Arnold and Wooley; alternates, Millhorn, *D. Eldred* and *Francis O'Dell*.

The installation ceremony was directed by *Walter Behlendorf*, pinch-hitting for *Earl Coffin*, whose string of twelve successive annual installation jobs was broken by unavoidable absence.

The annual financial report was presented by Treasurer O'Dell, and revealed the branch to be in good financial condition, O'Dell reported receipt of a $100 check from the *American Society for Metals* as the branch's share of profits as a participating society in sponsoring the Western Congress and Show.

Guests introduced by Sergeant-at-Arms *George Hess* included: *M. B. Perkins*, Wildberg Bros.; *Robert Jannen*, Fansteel Metallurgical Corp.; *King Ruhly*, Michigan Chrome & Chemical Co., Detroit, Mich., a member of Detroit Branch; *Warner Blazer* and *N. Dieball*, L. H. Butcher Co., *Harry Redding* and *Al Trott*, Kaiser Steel Co., Fontana, Cal.; *Leo Bjellin* and *Mary Fuller*, Kwikset Lock Co., Anaheim, Cal.

The new fiscal year was inaugurated by the induction of seven new members and receipt of applications from eleven others. Applicants are: *Leo Missel, Norman Freeman, Harry Redding, Ira Edwards, Edvin E. Court, Willard E. Henicke, David Jackson Collier, George Dupard, Norman Dieball, Warren Blazer* and *G. B. Mallory*.

Initiated were: *Marshall Huff, Bert Wombacher, M. B. Perkins, George W. Duncan, Charles A. Petriand, R. S. Patterson*.

The educational session speaker was *T. P. Rogers* of the Los Angeles office of the *American Chemical Paint Co.*, who read a paper on "Inhibitors for Metal Finishing," which had been prepared by *R. O. Bailey* of the company's main office technical staff.

New York Branch

The meeting was called to order by President *A. Amatore* on Friday, March 13, at the Hotel Statler, New York. Roll of officers was called and *J. Sterling* was noted absent. The minutes of the last meeting were read and approved. The following candidates

were elected to membership, and duly installed:

D. Manley, H. Bardony, S. Rosofsky, H. Hariton, Z. Gurzendo, A. Vivona, J. Alter, R. Bikoles, J. Restino.

The following transfer was read and accepted by this Branch: *E. G. Loeffel* (Bridgeport).

Election of new officers followed:

President: *A. Amatore.*
1st Vice-President: *A. Fusco.*
2nd Vice-President: *D. Hartshorn.*
Financial Secretary: *G. Copperman.*
Librarian: *P. Veit.*
Sergeant-at-Arms: *I. Goldwasser.*
Secretary-Treasurer: *G. Schore.*
Recording Secretary: *L. Levinson.*
Board of Managers: *M. Maher.*
Delegates: *F. MacStoker, A. Amatore, G. Schore.*
Alternates: *G. Herrmann. M. Nadel, D. Hartshorn.*
Educational Committee: *L. de Waltoff, Carlson, Nadel, Herrmann, Taub* and *Hartshorn.*

Mr. M. Nadel made a motion and it was duly seconded that the New York Branch accept the Schaefer proposal.

The meeting was turned over to the librarian *P. Veit* who in turn, presented a sound and color film "Electro Painting" by the *Ransberg Electro Coating Co.*, which was most interesting to all.

Baltimore-Washington Branch

On Tuesday, March 10, 1953, at 8:00 P.M., the Baltimore-Washington Branch held a meeting at the National Bureau of Standards, Washington, D. C.

The following slate of officers was proposed and unanimously elected:

President: *Vincent J. Hughes.*
Vice-President: *Asaf A. Benderly.*
Secretary: *Carl H. Thiede.*
Treasurer: *William Metzger, Jr.*
Librarian: *Tillman J. Gressitt.*

These officers were inducted into office by A.E.S. Past-President *Ken Huston.*

The *Ralph Schaefer* proposal to enlarge the A.E.S. proceedings was touched upon. Delegates will be instructed on this matter at the May meeting of the Branch.

The program for the evening consisted of a session intended to benefit the users of electroplating. Mr. *Fielding Ogburn* presented a brief outline of the subject of electroplating. This was followed by the placing of plating questions before a "panel of experts." The questions were devised by the audience which largely consisted of invited consumers of plating. It is hoped that this experiment served to further acquaint the visitors with the subject of plating and yielded some authoritative answers to their problems in this field. Also, it is believed that the questions enabled the member platers to improve their service to all.

Pittsburgh Branch

The *Pittsburgh Branch* held its regular monthly meeting on March 12, at the Sheraton Hotel. Fifteen (15) members attended dinner and twenty-nine (29) members attended the business session.

We were very happy to welcome a crop of new members into our Branch. They were: *Joseph R. Kristofik, James Robert Crain, Robert E. Harrover, Jr., Wenzel L. Bohman, David Martin Roney, Jr., James W. Condon,* all of Westinghouse; *Loren W. McOmber,* E. I. DuPont, and *Eli Shay,* Wean Engineering. One new application, *Edward A. Dantini,* Standard Steel

Spring, was presented for consideration.

Bill Wilson, our Annual Banquet chairman, reported that all plans have been completed for our Saturday night affair on May 2, at the Sheraton Hotel. Joe Schaeffer and his orchestra will entertain us and there will be numerous door prizes along with an elaborate program.

The main business of the evening was the election of officers for the next fiscal year. The new officers are: *E. B. Washburn*, President; *R. E. Varner*, first vice-president; *R. H. Schindler*, second vice-president; *Myron Ceresa*, librarian; *Wm. D. Wilson*, secretary; *Carl McHattie*, treasurer. Delegates: *R. Goldbach, R. A. Woofter, E. B. Washburn;* alternate delegates, *Leslie Lancy, Leo Schmitt, Sr., Myron Ceresa.*

After the election we were shown a film donated by the *Aluminum Co. of America* which presented a picture of research and development in a most interesting and entertaining manner.

The balance of the evening was spent in good fellowship and consuming beverages.

R. H. Schindler,
Secretary

Chicago Branch

Joe Andrus of Croname, Inc., is the new president of Chicago Branch for 1953-54. His election brings to him a well deserved reward for many years of unselfish service to the purposes of the *American Electro Platers' Society*. He will be ably assisted in his new offices by *Elmer Olson* of Oakite as 1st vice-president, *Ed Stanek* of Belke Mfg. as 2nd vice-president, and *Russ Harr* of Western Electric as librarian. All the above officers were elected unanimously at the March 13 meeting and will be installed at the April meeting with proper ceremonies.

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After the election, *Joe Gurski* of the Ford Motor Co. presented an interesting paper on the plating of auto parts. He gave an important emphasis to the important contribution that the automotive industry makes to the science of electroplating. Since automobile production contributes so vastly to the American economy, it follows that quality finishing is a necessary concern for that industry and all who participate in its production. Many innovations in plating techniques were originated by the auto industry which today are accepted as standard procedures by the plating brotherhood. Joe Gurski is to be complimented for his keen insight into this aspect of our business and for bringing his knowledge and experience to the members of our society.

The April meeting promises to be an unusual one what with installation of new officers and ladies night. All members are urged to bring their wives or sweethearts for a rare evening of good fellowship. Cocktails, dinner, an interesting educational session keyed to the ladies leanings and afterwards late refreshments and conversation. Chicago's April meetings have always been enthusiastically received and this one promises to surpass all others. Don't forget about the door prizes. Certain lucky ladies will receive valuable prizes selected by *Miss Eileen Drews* of the Western Electric Company.

*****

Charlie Geldzhouer of the Research Finance Committee announced two new members—James Plating Co. and American Phenolic Corp. Chicago Branch is on the move in this department. Watch our efforts grow!

Old timers will be saddened by the recent passing of *Joe Chaplik* of J. C. Furniture Mfg. Co. Joe had hundreds of friends in the industry and will always be remembered for his kindness and genuine interest in the purposes for which our society was founded. After almost 40 years in the plating game, spent largely in the tubular furniture field, Joe has gone to Plater's Paradise—no nickel shortages, no solution problems—just perfection. The business which he founded will be carried on by his son *Louis Chaplik*.

*****

Marv Daniels of Hotpoint remains in a critical condition as a result of an accidental shooting which occurred last December. Marv had the misfortune of doing some shopping while a hold-up was in progress. The resultant shooting accidentally struck Marv and has kept him confined to a hospital under strict supervision. He is not permitted visitors. Our earnest wishes for his early recovery are conveyed.

*****

Harold Faint, long active in A.E.S. affairs announces his new association with the Frederic B. Stevens Co. Harold is leaving the Industrial Filter & Pump Mfg. Co., to take on his new responsibilities. Good luck, Harold.

*****

And *Ewell McCoy* has hit the sawdust trail. He is now selling plating equipment for the George A. Stutz Mfg. Co. He was formerly associated with Chrome-Rite of Chicago as plating superintendent.

*****

Just received news of the passing of *Jacob Hay*, one of Chicago's best known plating equipment suppliers. Mr. Hay was vacationing in Florida when stricken on March 21. Our deepest sympathy to the family and especially to his son, Laurie, who will now continue in the management of the business.

Indianapolis Branch

One of the largest groups of members and guests of the Indianapolis Branch turned out for the April 1st meeting at Fox Steak House. Thirty-five members and sixteen visitors enjoyed a steak dinner and a good program. The Secretary's minutes for March were read and approved. Two new members were voted into the Society in a motion by *Quentin Shockley* and seconded by *Roman Bender*. The new members are *James E. Abel*, R. No. 4, Columbus and *Earl M. Messmore*, 1964 Ruckle Street, Indianapolis. The final reports of the Educational Session and Dinner Dance committees of April 25th were given and everything is just about ready for a very fine day.

At 8:20 P.M. the speaker of the program was introduced who was *Perry Miller* of the Indiana State Board of Health. Mr. Miller discussed the code which is in effect in Indiana concerning stream pollution. The Stream Pollution Board consists of seven members, representing education, farmers, industries, and engineers. The duty of this committee is to prevent and control stream pollution and not to advance the sale of costly treatment equipment.

Mr. Miller stated stream pollution can be prevented by having good housekeeping in the plants which in the long run will save in other ways. He presented three books which are

available at a nominal cost put out by the Ohio River Valley Water Sanitation Commission. The stream pollution code which is in effect since January 10, 1953 can be changed only after a public hearing is granted. This code is an assurance to the board that measures be taken to stop anything getting into the streams in the state. Ways were suggested for plating departments to alleviate any escape of cyanide into sewers were pits around tanks and separation of rinse water from floor drain systems.

The question of how to enforce the code was discussed by Mr. Miller. At least 1,000 industries in the state use cyanide. A letter is to be sent to each industry, a copy of the code and two copies of inventory form. This inventory form is to be filled out and returned. These will be in the mail very soon.

Mr. Miller stressed the board is not going to be tough so to speak on anyone but the code will be enforced. Each industry will be checked and many are not in the wrong about disposal of cyanide. A personal check will be given any industry if they so desire concerning the drainage.

Mr. Pritchard, a member of the Ohio Valley Water Sanitation Commission was present and reported on the progress of that commission. Their chief interest is in the preservation of fish and the use of water for public consumption.

Discussion and questions by the group took place after the talk and much interest was shown in this subject.

The next Branch meeting will be at Columbus, Indiana on May 6th with dinner in Arvin Cafeteria. Election of officers will be the business of the evening. The program will be a demonstration of colored television in Arvin Television Division. *John Holland* is in charge of this meeting and program.

The meeting adjourned at 9:50 P.M.

Edna Rohrbaugh,
Secretary.

Cincinnati Branch

The Cincinnati Branch of the American Electroplaters' Society held its first educational session and dinner dance in many years on March 28th, at the Sheraton-Gibson Hotel with a banner turn-out for both the afternoon meeting, and the dance. That the entire proceedings were an unqualified success was the unanimous opinion of all and a credit to the outstanding work by Messrs. *Nuzum, Miller, Loveless, Blount, Barry, Buchanan* and their various committees. Their effects were appreciated by all.

The proceedings got off to a fine start at a luncheon hosted by the branch officers with *Clyde Kelly*, 3rd National A.E.S. vice-president and the various speakers as their guests. After chairman *Ray Barry* opened the session putting Mr. Kelly at the helm, Cincinnati's Ezra Blount gave a most illuminating dissertation on plating in Japan—some 20 years behind methods in this country—and a brief sketch on Japanese life.

Carl F. Hansen of The Advance Tinning Co., Chicago, followed with an excellent talk on the "Principles of Effective Job Shop Management." stressing the advantages of wage incentives and a bonus system by which the employees share in the profits.

Of particular concern to platers in the Ohio Valley at this time is waste

disposal, so a symposium on waste treatment was most appropriate, with *Hudson Biery*, Ohio Commissioner to the Ohio River Valley Water Sanitation Commission discussing the necessity of treating waste while *H. S. Kline*, Industrial Hygiene Engineer, Frigidaire Division, G.M.C., Dayton, talked on various "Methods for Treating Metal Finishing Wastes." These gentlemen were then joined in a panel on waste treatment by *J. E. Kinney*, Sanitary Engineer, Ohio River Valley Water Sanitation Commission, and *A. M. Reed* of Electric Auto-Lite Co., Lockland.

A capacity crowd of over three hundred persons attended the dinner in the Sheraton-Gibson ballroom, and witnessed an outstanding floor show. Dancing and convivial fellowship concluded the day's festivities with the curtain ringing down at 1:00 A.M.

Charles Wise,
Secretary

Los Angeles Branch

All attendance records for twenty-two previously held similar affairs were broken at the 23rd Annual educational session and dinner dance of Los Angeles Branch, American Electro-Platers' Society, held March 22 at the Hotel Statler, Los Angeles.

LeRoy Camel (Seated), sales manager, and Stuart Millar, Detrex Corp., Detroit, Mich.

Reservations committee members *Fred Raymond*, *Truman Stoner* and *Kasmir Tarczynski* were swamped with requests for 500 tickets to the dinner dance, a surprising increase over the 450 who attended in 1952, a record up to that time. Attendance at the morning and afternoon technical sessions averaged 150 and, at the noonday luncheon, the capacity of the Sierra Room was challenged when 165 showed up.

Generous credit for the record attendance figures must be given to general chairman *George Hetz* of the *Mefford Chemical Co.*; *Stuart Krentel* of the *A. J. Lynch Co.*, who provided what was undoubtedly the finest quartet of technical speakers ever assembled before a Los Angeles Branch affair; to *John Millhorn* for the superb entertainment he provided; and to *Frank Virgil*, who, as master-of-ceremonies, conducted the annual story telling contest with the skill of a George Jessel.

One-hundred-fifty-five members and guests were present when president *Myron Orbaugh* called the first technical session to order at 9:30 a.m.

Educational chairman Krentel introduced as the first speaker *LeRoy Camel*, sales manager of the *Detrex Corp.*, Detroit, Mich. His subject was "Ultra-Sonic and Periodic Reverse Current Cleaning." Assisting Mr. Camel in the question-and-answer period and in a demonstration of the process, was *Stuart Millar*, the company's director of public relations.

The interest which this new devel-

R. O. Hull of the R. O. Hull Co., Inc., Rocky River, Ohio. (with rectifier testing device which he demonstrated).

opment in plating invoked was attested by the large number of persons who grouped themselves about the demonstration tables for a half hour after the formal talk was concluded. (Similar demonstrations were given the following week by Messrs. Camel and Millar at the Detrex booth at the Western Metal Show in Pan Pacific Auditorium, Los Angeles).

R. O. Hull of *R. O. Hull Co., Inc.*, Rocky River, Ohio, appeared as the second speaker on the morning program. His subject was "Tuning Up For Plating Production."

His talk, in the main, concerned itself with experiments the company had made, starting about a year ago, in connection with efforts to determine why brighteners were not working as well as previously. Of some forty tests on rectifiers made in the course of the experiments, Mr. Hull said that 30 were found to be faulty. It was also discovered that a rectifier which might function poorly for cadmium or zinc, would work better when transferred to cadmium and chromium.

By means of slides this speaker showed what happens with different types of rectifiers. That with nickel baths, for instance, low frequency current effects the porosity of the deposit; that half-wave rectifiers should not be used with chromium, since they cut down on the throwing power; that with copper, intermittent current is actually beneficial.

The noon luncheon was held in the Statler Sierra Room, with Frank Virgil of the *L. H. Butcher Co.* as master-of-ceremonies. In conformance with established custom all reference to business and technical matters was forbidden. Highlight of the luncheon

W. W. Cadwallader, A. J. Lynch & Co., Los Angeles, who read technical paper prepared by Harold R. Smallman of Hanson-Van Winkle-Munning Co.

was the annual story telling contest. Fifteen aspirants walked to the microphone to relate humorous stories in the hope of winning one of the three prizes, which were awarded in ratio to the volume of applause each story precipitated.

The winner, and now holder of the title of "Best Story Telling Plater in Southern California," was *Caroll McLaren*, owner of the Santa Ana Plating Works, Santa Ana, Calif. Mac's tale concerned a traveling salesman who

instructed the bellboy to bring him seventeen martinis and a bull-fiddle. The alliterative "snap" with which the story was concluded evoked a storm of applause which won first prize for McLaren.

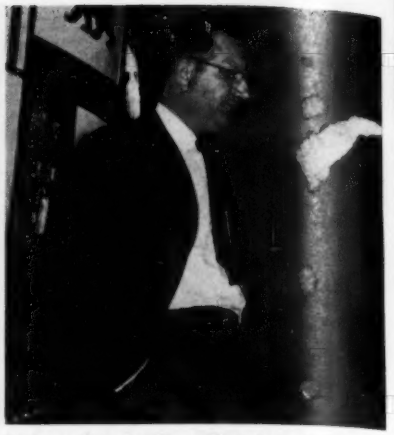
A story about a plater who quit the business to become a cook, told by *Louis E. Shaw*, a Chicago plater for 50 years, was adjudged second best. The dialectic and energetic manner in which *Paul Franke* of the Price Pfister Co. related a story about a mother-in-law's advice to her daughter-in-law, earned third place. This made Paul a double-threat man, for he had also won the annual waltz contest one year.

Myron Orbaugh told one about two soldiers assigned to bury a dead mule. and their puzzlement as to whether they were interring a mule, a jackass or a burro, until two Wacs solved the puzzle for them. *A. L. Spicer's* effort about a snake, to whom the gods granted three wishes barely lost out for third place. *John Merigold* submitted a story about "nails" which had no connection with either a plating shop or a hardware store. Others who entered the list with a "If you've heard this one. stop me!" were *Harold Kroesche*, *John Simel* of San Francisco, *Harold Jannings*, *Jack Raskin*, *Dick Wooley*, *John Millhorn*, *R. C. Berry* and *Glen Beckman*.

A paper prepared by *Harold R. Smallman* of the *Hanson-Van Winkle-Munning Co.* on "Design of The Modern Plating Room" was first on the program of the afternoon technical session. Mr. Smallman was unable to attend and his paper was read by *W. W. Cadwallader*, president of the *A. J. Lynch Co.*, whose firm recently was appointed California distributor for the H.-V.W.-M. line.

The concluding talk was presented by *Herbert DeLong* of the *Dow Chemical Co.* Midland, Mich., on "Electroplating on Magnesium."

The annual dinner dance was held in the Statler Pacific Room beginning at 7:30 p.m. Attendance of 500 plus set a new record for the annual event. The Door Prize Committee, composed of *Larry O'Neill* (chairman), *Harvey Hunt*, *John Manning* and *Philip Simon* produced an outstanding array of beautiful prizes ranging from condiment sets, silvered platters, plates and tea sets, to valuable cameras and a wide variety of plating shop chemicals, compounds and equipment pieces.



Herbert Delong, Dow Chemical Co., Midland, Mich.

James Sowell of the *Electroplating Division, Federated Metals Co.*, Los Angeles, won what he and many others regarded as the most valuable prize, an Argus camera. *Sherman Gobles* of Federated's New York office won a less valuable but more intriguing prize —an art photo of Marilyn Monroe in the pose which has won her so much publicity recently. One hundred product prizes and 100 cash prizes were awarded, the total value of the collection being appraised in excess of $1,500.

Fred Edmunds, Los Angeles, Bethlehem Coast Steel Corp., Los Angeles, Calif.

Highlight of the ball was the annual waltz contest. One hundred couples entered the contest. These were weeded down first to 12, then 6 and finally to the three winners. First prize went to *Mr. and Mrs. Rene E. LaLaurette* (Rene is in *Don Bedwell's* plating department at the Hall-Mark Co., Los Angeles); second prize to *Mr. and Mrs. A. Powell* (Menasco Mfg. Co., Burbank); and third prize (much to Walter's amazement) to *Mr. and Mrs. Walter E. Behlendorf* (Spence Electroplating Co., Los Angeles).

In addition to those already mentioned, the following were active on the committees: Registration, *Harold Wanamaker* and *Ernest Fest;* Tickets and Reservations: *Fred Raymond, Truman Stoner* and *Kasmir Tarczyinski;* Luncheon, *Frank Virgil;* Decorations, *James Sowell;* Favors, *Jack Beall;* and Publicity, *William Nairne.*

Among those present at this meeting was *Mrs. Joan T. Wiarda* sales manager of METAL FINISHING.

Photographs courtesy *Stuart Krentel, A. J. Lynch & Co.*

THE ELECTROCHEMICAL SOCIETY, INC.

Future Meetings of the Society

September 13-16, 1953, Ocean Terrace Hotel, Wrightsville Beach, N. C. Sessions on Corrosion, Electrodeposition, and Battery. Other Divisions may schedule sessions, in which event an announcement will be made.

May 2-6, 1954, La Salle Hotel, Chicago, Ill. Sessions to be announced at a later date.

AMERICAN SOCIETY FOR TESTING MATERIALS

Committee B-8 met in Detroit, Mich., recently. Sub-committee II on Performance Tests will make available as an appendix to the B-8 report, data on the copper-nickel-chromium and lead deposits over steel. These tests have been on exposure for some 8½ yrs., as of the 1952 inspection, and sufficient data have now been accumulated so that it may be possible to draw some definite conclusions. A method for rating panels has been developed by this subcommittee and is currently out to letter ballot of the main committee.

The Subcommittee on Electroplating Practice is continuing its activity with the submittal to the Society in June of a recommended practice for preparation of and plating on copper alloys. In view of the lack of interest, the section on plating of plastics has been dissolved but the two remaining sections, one on plating on lead and one on malleable and cast iron are making steady progress and recommended practices for these two materials should be available within the next year. It was voted, subject to letter ballot, to advance other recommended plating practices to standard. These include recommended practices for B242 (high

carbon steel) B252 (zinc), B253 (aluminum), and B254 (stainless steel).

New work of the committee includes the establishment of a section to develop a recommended practice for alkaline cleaning.

An entirely new field of work to be undertaken by the committee will cover the field of tin plating. This investigation will include performance test of tin coatings on steel and copper as well as the behavior of tin-zinc, tin-lead, tin-cadmium, tin-copper, and tin-nickel coatings. One of the big unanswered problems is that of methods of testing and anticipating the solderability of tin coatings.

A.E.S. Research Project No. 15 which is endeavoring to create a more realistic and reproducible test than the current salt spray test is of interest to Committee B-8 and the Society as a whole. Their program envisages a broad test program of nickel and copper-nickel-chromium finishes on steel and die-cast base materials. These panels will be exposed on the front license plate holders of a fleet of taxis in the Detroit area. Accelerated tests will include (a) salt spray and low temperatures with and without the addition of corrosive gasses such as SO_2, (b) the modification of standard salt spray and acetic acid-salt spray tests including periodic infrared drying, (c) continuous immersion in materials scraped from the streets, (d) alternate chilling and spraying with corrosive solutions, (e) investigation of the effect of temperature on galvanic action, (f) positional effect in the paint spray cabinet, (g) use of wetting agents, (h) use of oxidizing agents, and (i) water line effect in immersion tests. Officers of Committee B-8 are: Chairman, *C. H. Sample*, of the *International Nickel Co., Inc.* and Secretary, *R. B. Saltonstall, The Udylite Corp.*

LETTER TO THE EDITOR

MF in a Pickle

Metal Finishing
Westwood, N. J.

Gentlemen:

Please send another copy of the February issue of METAL FINISHING. I received one, but the plater was reading it alongside the tank and it fell into the solution. I can't use it as plating material or as reading material either, so please forward another copy with the charges.

Sincerely yours,
Charles R. Wirth

Duplicate copy sent without charge.—*Ed.*